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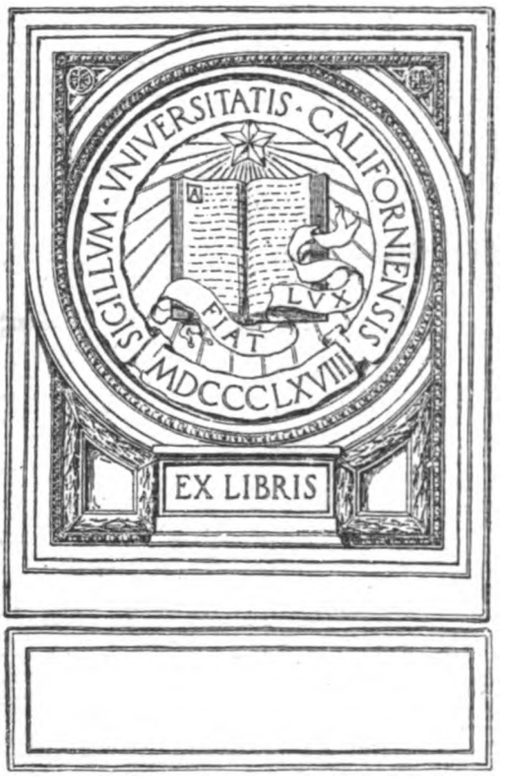
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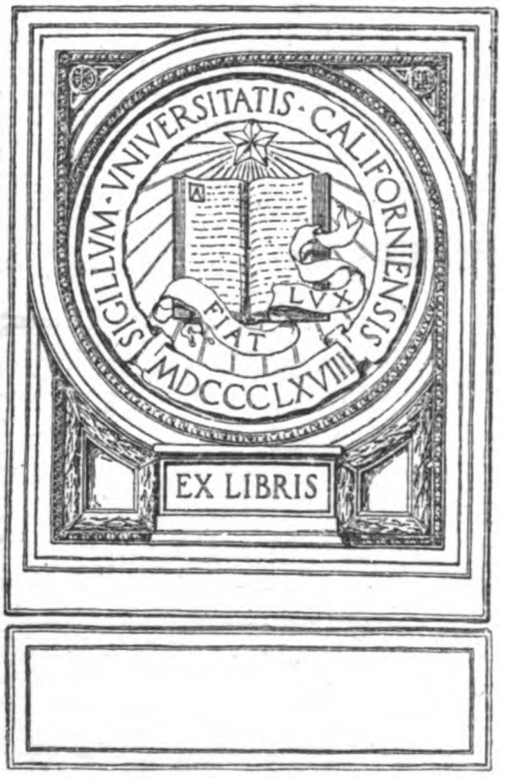
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Forecast of New York Shows—Body Construction

15 CENTS the COPY

The MOTOR TRUCK

Devoted to Motor Driven Business Vehicles of All Classes.

Vol. III Pawtucket, R. I., January, 1912. N.S.E. No. 1

Who Sells the Fleets?

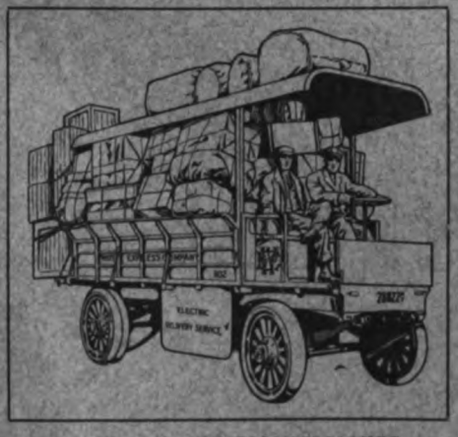
TRADE GENERAL VEHICLE GREATEST VALUE MARK

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The General Vehicle Company has nearly 40% of its output, or over one thousand (1000) G. V. Electrics divided among one hundred customers. Twenty of these customers operate an average of 29.2 G. V.'s each.

Over one million dollars ($1,000,000) worth of G. V. Electrics are used in brewery transportation service alone.

We have been building electric trucks and wagons since 1901 and many of the vehicles referred to above are from six to ten years old.



A G. V. 3 1-2 TON MONEY MAKER

These facts may upset your preconceived ideas of motor truck adaptability but a great many intelligent men will learn in the next few years that the electric truck—and particularly the G. V. Electric—is the best truck for 80 per cent. of all transfers and deliveries.

The G. V. Electric has the lowest maintenance cost of any power vehicle.

This because it is simple in construction and operation—economical as to power and has great durability.

Furthermore, all six G. V. models are standardized and all parts of each model are interchangeable and readily accessible.

Made in the following capacities: 750 lbs., 1000 lbs., 2000 lbs., 2 ton, 3 1-2 ton and 5 ton.

Catalog No. 80 and Other Data on Request

You will find us at the Madison Square Show, New York, January 15-20, with at least ten vehicles. Also at the Chicago Show, February 3-10, 1912.

GENERAL VEHICLE COMPANY

Works and General Offices, LONG ISLAND CITY, N. Y.

New York	Boston	Philadelphia	Chicago	St. Louis
505 Fifth Ave.	84 State Street	Witherspoon Bldg.	The Rookery	Wainwright Bldg.

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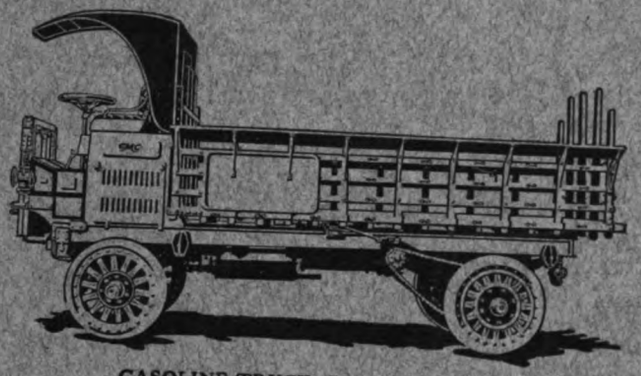
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COMPLETE INSTALLATIONS — GASOLINE — GMC — General Motors Company — TRUCKS — ELECTRIC — COMPLETE SERVICE

At the Madison Square Show

New York, January 15-20

and at the Chicago and Boston Shows



GASOLINE TRUCK—BREWERY BODY
Model K—5 Ton Capacity. Price, Chassis Only, $4400



ELECTRIC TRUCK—EXPRESS BODY
Model 3—3000 lbs. Capacity. Price, $1700, Chassis Alone, Batteries and Bodies Optional.

The prospective buyer of motor trucks cannot afford to consider a truck apart from the company that makes and sells it. If he is to get the maximum number of years' use from a truck—if he is to get the highest efficiency and the greatest economy in operation during those years—after the purchase must come service.

The G M C is the mark, not of a car, but of a company. G M C trucks have behind them the manufacturing facilities, the engineering and operating experience, and the financial permanence of the General Motors Truck Company—your banker will tell you what that means.

G M C service is a distinct department of the organization under a General Service Manager. The policy of this Service Department will be to insure to the purchaser a prompt service at times of emergency—in parts, personal assistance and co-operation.

Where it is desired, a special service will be rendered, before a sale is made, in a thorough analysis and study of any delivery or hauling requirements.

If you would build up a standardized delivery system, and have each truck a harmonious unit in the whole, select trucks built by a manufacturer who will be able to fill your future as well as your present requirements.

The G M C line includes gasoline and electric trucks in capacities of 1000 pounds to 6 tons.

Inspection of our exhibits at the New York, Chicago and Boston Commercial Car Shows is invited, as is correspondence from prospective purchasers and dealers.

GENERAL MOTORS TRUCK COMPANY

DETROIT, MICHIGAN

Branches: New York, Chicago, Boston, Philadelphia, Kansas City, Detroit

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The MOTOR TRUCK

Devoted to Motor Driven Business Vehicles of All Classes.

VOL. III. PAWTUCKET, R. I., JANUARY, 1912 No. 1

TWO NATIONAL TRUCK SHOWS IN NEW YORK.

Commercial Vehicle Display in Madison Square Garden Follows Week Devoted to Pleasure Cars---Power Wagons Share Interest at Grand Central Palace---Accessories to Be Seen at Both Exhibits.

AT NO time in the history of the automobile industry have so many differing makes of commercial motor vehicles been assembled for the inspection of the business man as will be true during the two national shows in New York City this month. Considered in its broadest application, this means that never before has the prospective purchaser of power wagons had such opportunity to study the various offerings side by side, with every possibility of determining their respective merits. This, in itself, should be sufficient reason why the modern business man should make every endeavor to visit the metropolis during these displays. Fortunately, those responsible for the success of the exhibitions have so arranged their dates that this unparalleled array of models in the two largest buildings of the city will be open for inspection at the same time.

To put the matter in more concrete terms, it should be noted that during the National Association of Automobile Manufacturers' show in the Grand Central Palace, Jan. 10-17, and the Automobile Board of Trade's display in Madison Square Garden, Jan. 15-20, there will be seen at least 66 different makes. This figure is based upon the reports now at hand, but as is usually true, there is every possibility that this number will be increased at the last moment. That this is the largest showing of commercial vehicles ever made is based upon the fact that the most comprehensive previous display was that during the second week of the Chicago show last year, when 57 manufacturers were represented. Something over 40 were to be seen at the 1911 Boston show, and this exceeded the number displayed at New York City last January.



Madison Square Garden, New York City, Looking from the 26th Street and Fourth Avenue Corner, Where the Automobile Board of Trade Shows Will Take Place Jan. 6-20.

It may be mentioned that the exhibits of accessories at the forthcoming New York shows also will set a new record, 363 firms as against 304 for Chicago, and 320 for New York in 1911. The 11th hour additions in this field always are much larger than with the vehicles, and it seems safe to predict that the total will reach very close to 400. As many of these supplies, parts and fittings, have a direct interest to the motor truck owners and users, it is anticipated that the accessory booths will prove quite as attractive to the business men as any other portion of the exhibitions.

While it may be considered that those directly concerned with power wagons will be less interested in the pleasure vehicles, it is worthy of note that the two New York shows will present at least 93 different makes of these. This number is but one behind that seen during the first week at Chicago last year, and exceeds the Madison Square Garden showing of 1911 by 23. The pleasure car show at the Garden this year will be held Jan. 6-13, while these types will share interest with commercial vehicles at the Grand Central Palace Jan. 10-17.

Thus it will be seen, that beginning with Jan. 6 and continuing until Jan. 20, ample opportunity will be afforded to study the best productions of American manufacturers in all lines. For those who desire to devote the greater portion of their time to motor trucks, it is possible to reach the city during the latter part of the first week, comparing the offerings of pleasure cars at Madison Square Garden and the Grand Central Palace, and remain over Sunday to complete the inspection of power wagons during the early portion of the second week.

In one sense the Grand Central Palace exhibition is an overflow from Madison Square Garden. There is no rivalry between the National Association of Automobile Manufacturers and the Automobile Board of Trade, at least not in the same sense which has marked previous displays in New York. Samuel A. Miles, general manager of the former organization, has worked in conjunction with the show committee of the latter with a view to presenting the most representative showing of cars, trucks and

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accessories possible. His 10 years' experience in managing the Chicago shows, as well as in assisting others in various sections of the country, is sufficient guarantee of success.

The new Grand Central Palace, which will house its first automobile show in this exhibition, is a 13-story structure on Lexington avenue, two blocks north of the old building of that name. The three exhibition floors are particularly fitting to an admirable architectural creation. The show space is a colonnade with gallery for the first and second floors, and the third floor also is in the nature of a gallery, the great central court of the second floor being contracted to half its size at this point, the floors being supported by pairs of massive columns on single pedestals. There is less need of decoration than were it a single arena, and the vehicles will be more prominent relatively.

Twenty-eight different makes of pleasure vehicles and two of service wagons will be seen on the first floor. Six makes of pleasure cars and 35 of motor trucks will be shown on the second. The latter will include everything from the small package delivery wagon to the heaviest truck, and with an almost endless variety of body constructions. Accessories will be displayed on both the second and third floors.

Of the manufacturers who will be represented at this show, it is stated that no less than 35 makers of cars made no display in the metropolis last year, and a large proportion will exhibit for the first time at any show. It hardly is necessary to point out that these exhibits will prove quite as interesting as those made by better known constructors.

The Madison Square Garden display is in charge of Col. George Pope, Alfred Reeves and Merle L. Downs, representing the Automobile Board of Trade. All of these men have been identified with automobile shows in this building for years, and there can be little doubt that they have exerted themselves to produce results which shall be even more successful in every particular than at previous events.



New Grand Central Palace, Lexington Avenue and Depew Place, Where the Show of the National Association of Automobile Manufacturers Will Take Place Jan. 10-17.

It is fitting that the display of machines shall have a setting of especial dignity, and yet it must be appropriate to the two divisions, the one for pleasure cars and the other for commercial vehicles. The decorations will be quite in keeping with this view, as indicated by an accompanying illustration. Vehicles will be shown on the main floor and two balconies, as was the case last year, while accessories will be found in the basement and on each of the floors other than the main floor. Motorcycles will be shown in connection with pleasure vehicles during the first week.

Promptly at 11 on the evening of Jan. 13, the pleasure car division will come to an end, and immediately thereafter the exhibitors will begin the work of removing their cars. This applies only to automobiles and motorcycles, since nearly all of the accessory makers will continue their display through the second week. The plan is the same as that adopted last year, and it is anticipated that there will be no delay in preparing the building for the second division, in which trucks will be the prominent feature.

The truck exhibit will open at 10 in the morning of Jan. 15. Most of these vehicles will be housed on the main floor, although the so-called elevated platform will be reserved for some of the lighter wagons and electrics. This will mean that it will be necessary to visit both floors in order to study all the business automobiles. The showing will be equally as complete as that during the first week, and there will be nothing to detract from the nature of the display.

With respect to the display of power wagons during the second week at Madison Square Garden, it should be said that there will be 26 makes of gasoline vehicles and six electrics. This statement is made having in mind the information now at hand. Inasmuch as there are yet some two weeks before the show is scheduled to open there is time for the addition of other models. It is remembered in this connection that two of the best known manufacturers entered exhibits at the last moment in 1911. At least three of the business vehicles have not been shown at previous displays. Inasmuch as the matter of body design has attracted no little attention in the motor truck field during the past few months, it is expected that the various manufacturers will devote rather more thought to this detail than in past years. Information at hand concerning both exhibits leads to the conclusion that considerable effort will be made toward the presentation of types for special lines. And it is practically certain that much can be learned concerning the possibility of adapting the various chassis shown for individual purposes. It is not probable that the manufacturers would allow the opportunity to pass for a careful study of this feature, and the business man who has special requirements in this line undoubtedly will find abundant means of acquiring knowledge of this subject.

In short, the practicability of the power wagon having been established the industry has reached a point where it is possible to devote much attention to the details of refinement in construction and design necessary to meet the varying needs of the user. The 66 makes on display in New York City this month will represent the best productions of American engineering. This applies with equal force to both commercial and pleasure vehicles, and may also be said to hold true with reference to accessories, parts, fittings and supplies.

On the following pages is presented a detailed list of the exhibitors at both buildings. This not only indicates where each make of truck may be found, but the pleasure cars as well. The accessories have been classified according to the various lines, making it possible for the visitor to lay his plans for inspecting that which he desires to see, before leaving home. In this connection the diagrams of floor spaces should prove most helpful. It will be noted that the various makes of cars and lines of accessories have been arranged in alphabetical order. It is believed that this plan will be thoroughly appreciated.

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MADISON SQUARE GARDEN EXHIBITORS.

COMMERCIAL VEHICLES

11A—
Alco, American Locomotive Company, Providence, R. I.

6A—
Autocar, Autocar Company, Ardmore, Penn.

109A—
Baker, Baker Motor Vehicle Company, Cleveland, O.

106½A—
Bronx, Bronx Electric Vehicle Company, New York, N. Y.

103A—
Brush, Brush Runabout Company, Detroit, Mich.

114A—
Buick, Buick Motor Company, Flint, Mich.

104A—
Cartercar, Cartercar Company, Pontiac, Mich.

106A—
Detroit Electric, Anderson Electric Car Company, Detroit, Mich.

4A—
Garford, Garford Company, Elyria, O.

111A—
General Vehicle, General Vehicle Company, Long Island City, N. Y.

115A—
General Vehicle, General Vehicle Company, Long Island City, N. Y.

10A—
Grabowsky, Grabowsky Power Wagon Company, Detroit, Mich.

14A—
Hewitt, Metzger Motor Car Company, Detroit, Mich.

1A—
Knox, Knox Automobile Company, Springfield, Mass.

3A—
Locomobile, Locomobile Company of America, Bridgeport, Conn.

16A—
Lozier, Lozier Motor Company, Detroit, Mich.

102A—
McIntyre, W. H McIntyre Company, Auburn, Ind.

15A—
Mack, Mack Bros. Motor Car Company, Allentown, Penn.

105A—
Morgan, Morgan Motor Truck Company, Worcester, Mass.

12A—
Packard, Packard Motor Car Company, Detroit, Mich.

9A—
Peerless, Peerless Motor Car Company, Cleveland, O.

2A—
Pierce-Arrow, Pierce-Arrow Motor Car Company, Buffalo, N. Y.

18A—
Pope-Hartford, Pope Manufacturing Company, Hartford, Conn.

110A—
Rapid, General Motors Truck Company, Detroit, Mich.

8A—
Reliance, General Motors Truck Company, Detroit, Mich.

113A—
Reo, Reo Motor Car Company, Lansing, Mich.

17A—
Sampson, Alden Sampson Manufacturing Company, Detroit, Mich.

5A—
Speedwell, Speedwell Motor Car Company, Dayton, O.

7A—
Stearns, F. B. Stearns Company, Cleveland, O.

101A—
Studebaker, Studebaker Automobile Company, South Bend, Ind.

107A—
Ward, Ward Motor Vehicle Company, New York, N. Y.

13A—
White, White Company, Cleveland, O.

PLEASURE CARS.

EP 103—
Alco, American Locomotive Company, Providence, R. I.

EP 106—
American, American Motors Company, Indianapolis, Ind.

EH 51—
Amplex, Simplex Motor Car Company, Mishawaka, Ind.

B 207—
Atlas, Atlas Motor Car Company, Springfield, Mass.

EP 113—
Autocar, Autocar Company, Ardmore, Penn.

B 213—
Baker, Baker Motor Vehicle Company, Cleveland, O.

EP 112—
Brush, Brush Runabout Company, Detroit, Mich.

MF 14—
Buick, Buick Motor Company, Flint, Mich.

MF 16—
Cadillac, Cadillac Motor Car Company, Detroit, Mich.

EH 55—
Cartercar, Cartercar Company, Pontiac, Mich.

MF 21—
Chalmers, Chalmers Motor Company, Detroit, Mich.

EP 116—
Columbia, Columbia Motor Car Company, Hartford, Conn.

EP 117—
Corbin, Corbin Motor Vehicle Corporation, New Britain, Conn.

B 206—
Daimler, Daimler Import Company, New York, N. Y.

B 214—
Detroit Electric, Anderson Electric Car Company, Detroit, Mich.

MF 23—
E-M-F, Flanders, E-M-F Company, Detroit, Mich.

EP 104—
Everitt, Metzger Motor Car Company, Detroit, Mich.

EP 105—
Elmore, Elmore Manufacturing Company, Clyde, O.



The Interior Decorations of Madison Square Garden for the 1912 Exhibition.

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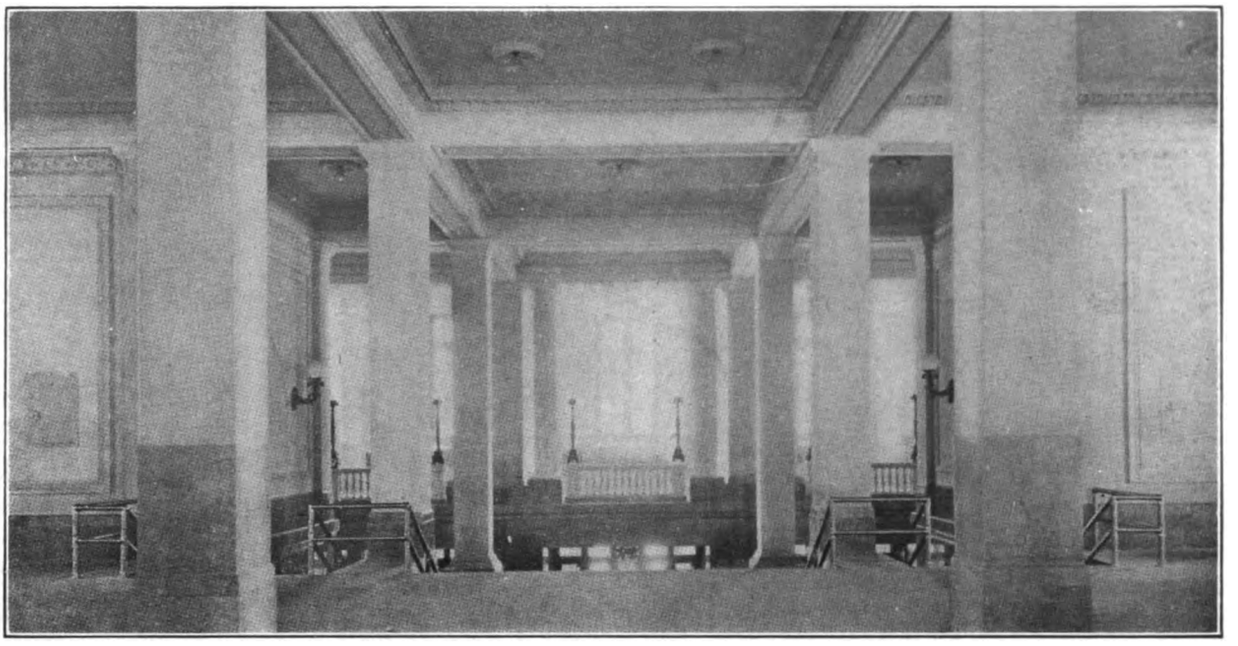
B 212—
Flanders, Flanders Manufacturing Company, Pontiac, Mich.
MF 8—
Franklin, H. H. Franklin Manufacturing Co., Syracuse, N. Y.
B 201—
Garford, Garford Company, Elyria, O.
EP 114—
Haynes, Haynes Automobile Company, Kokomo, Ind.
MF 20—
Hudson, Hudson Motor Car Company, Detroit, Mich.
EH 50—
Inter-State, Inter-State Automobile Company, Muncie, Ind.
EP 111—
Jackson, Jackson Automobile Company, Jackson, Mich.
EP 121—
Knox, Knox Automobile Company, Springfield, Mass.
EP 115—
Lambert, Buckeye Manufacturing Company, Anderson, Ind.
MF 10—
Locomobile, Locomobile Company of America, Bridgeport, Conn.
EP 119—
National, National Motor Vehicle Company, Indianapolis, Ind.
MF 4—
Oakland, Oakland Motor Car Company, Pontiac, Mich.
B 202—
Ohio, Ohio Motor Car Company, Cincinnati, O.
MF 1—
Oldsmobile, Olds Motor Works, Lansing, Mich.
MF 15—
Overland, Willys-Overland Company, Toledo, O.
MF 17—
Packard, Packard Motor Car Company, Detroit, Mich.
B 205—
Palmer-Singer, Palmer & Singer Manufacturing Company, Long Island City, N. Y.
MF 11—
Peerless Peerless Motor Car Company, Cleveland, O.
EH 54—
Pierce, Pierce Motor Company, Racine, Wis.
MF 19—
Pierce-Arrow, Pierce-Arrow Motor Car Company, Buffalo, N. Y.
B 203—
Speedwell, Speedwell Motor Car Company, Dayton, O.
EH 53—
Simplex, Simplex Automobile Company, New York, N. Y.
EP 102—
Thomas, E. R. Thomas Motor Company, Buffalo, N. Y.
B 215—
Waverley, Waverley Company, Indianapolis, Ind.
MF 9—
Winton, Winton Motor Carriage Company, Cleveland, O.
MF 2—
White, White Company, Cleveland, O.

MF, Main Floor. EP, Elevated Platform. B, Balcony. EH, Exhibition Hall.

ACCESSORY EXHIBITORS.

Automobile Bodies.

***219—**
Hayes Manufacturing Company, Detroit, Mich. Bodies, boxes and metal specialties.



Main Entrance to Grand Central Palace as Seen from the Main Hall, Looking Toward the East.

MF 7—
Lozier, Lozier Motor Company, Detroit, Mich.
EP 101—
Marmon, Nordyke & Marmon Company, Indianapolis, Ind.
B 204—
Marquette, Marquette Motor Car Company, Saginaw, Mich.
EP 120—
Matheson, Matheson Automobile Company, Wilkesbarre, Penn.
MF 18—
Maxwell, Maxwell-Briscoe Motor Company, Tarrytown, N. Y.
B 208—
McIntyre, W. H. McIntyre Company, Auburn, Ind.
EH 52—
Mercer, Mercer Automobile Company, Trenton, N. J.
MF 12—
Mitchell, Mitchell-Lewis Motor Company, Racine, Wis.
EP 107—
Moline, Moline Automobile Company, East Moline, Ill.
EP 118—
Moon, Moon Motor Car Company, St. Louis, Mo.
MF 5—
Pope-Hartford, Pope Manufacturing Company, Hartford, Conn.
EP 108—
Premier, Premier Motor Manufacturing Company, Indianapolis, Ind.
EP 116—
Pullman, Pullman Motor Car Company, York, Penn.
MF 22—
Reo, Reo Motor Car Company, Lansing, Mich.
B 209—
S. G. V., S. G. V. Company, Reading, Penn.
MF 13—
Stevens-Duryea, Stevens-Duryea Company, Chicopee Falls, Mass.
MF 6—
Stearns, F. B. Stearns Company, Cleveland, O.
MF 3—
Stoddard-Dayton, Dayton Motor Car Company, Dayton, O.
EP 109—
Selden, Selden Motor Car Company, Rochester, N. Y.
***224—**
Springfield Metal Body Company, Springfield, Mass. Metal automobile bodies.

Axles.

178—
American Ball Bearing Company, Cleveland, O. Rear axles.
534—
Sheldon Axle Company, Wilkesbarre, Penn. Front and rear axles, jackshafts, etc.
254—
Stutz Auto Parts Company, Indianapolis, Ind. Stutz axles, transmissions, etc.
166—
Timken-Detroit Axle Company, Detroit, Mich. Timken axles, etc.
****313—**
Torbenson Gear & Axle Company, Bloomfield, N. J.
176—
Warner Gear Company, Muncie, Ind. Warner transmissions, axles, etc.
236—
Warner Manufacturing Company, Toledo, O. Axles, transmissions, gears, etc.

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170— Westen-Mott Company, Flint, Mich. Axles, rims, hubs, etc.

Ball Bearings.

586— Bantam Anti-Friction Company, Bantam, Conn. Anti-Friction ball bearings.

587— Barthel, Daly & Miller, New York, N. Y. Schafer ball bearings.

305— Hess-Bright Manufacturing Company, Philadelphia, Penn. Ball bearings, ball bearing lubricants.

558— Imperial Bearing Company, Detroit, Mich. Imperial ball bearings.

223— New Departure Manufacturing Company, Bristol, Conn. Ball bearings, metal specialties.

543— Rhineland Machine Works Company, New York, N. Y. Rhineland ball bearings.

*623— R. I. V. Company, New York, N. Y. R. I. V. ball bearings.

138— Diamond Chain & Manufacturing Company, Indianapolis, Ind. Diamond chains, chain cases.

588— S. Hoffnung & Co., Ltd., New York, N. Y. Coventry chains.

229— Link-Belt Company, Indianapolis, Ind. Maximum silent chains.

179— Whitney Manufacturing Company, Hartford, Conn. Whitney chains, special machines, Woodruff keys.

Chains—Tire.

586— Atlas Chain Company, Brooklyn, N. Y. Atlas tire chains.

142— Weed Chain Tire Grip Company, New York, N. Y. Weed tire chains.

Demountable Rims.

*519— American Rim Company, New York, N. Y. Lambert rims.

*292— Booth Demountable Rim Company, Cleveland, O. Booth demountable rims.

233— Dorian Remountable Rim Company, New York, N. Y. Dorian remountable rims.

539— Newmastic Tire Company, New York, N. Y. Parker rims.

Drop Forgings.

260— Driggs-Seabury Ordnance Corporation, Sharon, Penn. Drop forged and pressed steel products.

175— J. H. Williams Company, Brooklyn, N. Y. Drop forgings.

*289— Western Tool & Forge Company, Breckenridge, Penn. Drop forgings.

Dry Battery Cells.

132— National Carbon Company, Cleveland, O. Columbia dry cells.

Electric Horns.

245— Automobile Supply Manufacturing Company, Brooklyn, N. Y. Newtone horns.

140— Atwater Kent Manufacturing Works, Philadelphia, Penn. Monoplex horns.

243— Dean Electric Company, Elyria, O. Tuto electric horns.

226— Lovell-McConnell Manufacturing Company, Newark, N. J. Klaxon and Klaxonette horns.

*414— Typhoon Signal Company, Chicago, Ill. Typhoon electric horns.

Electric Lighting Systems.

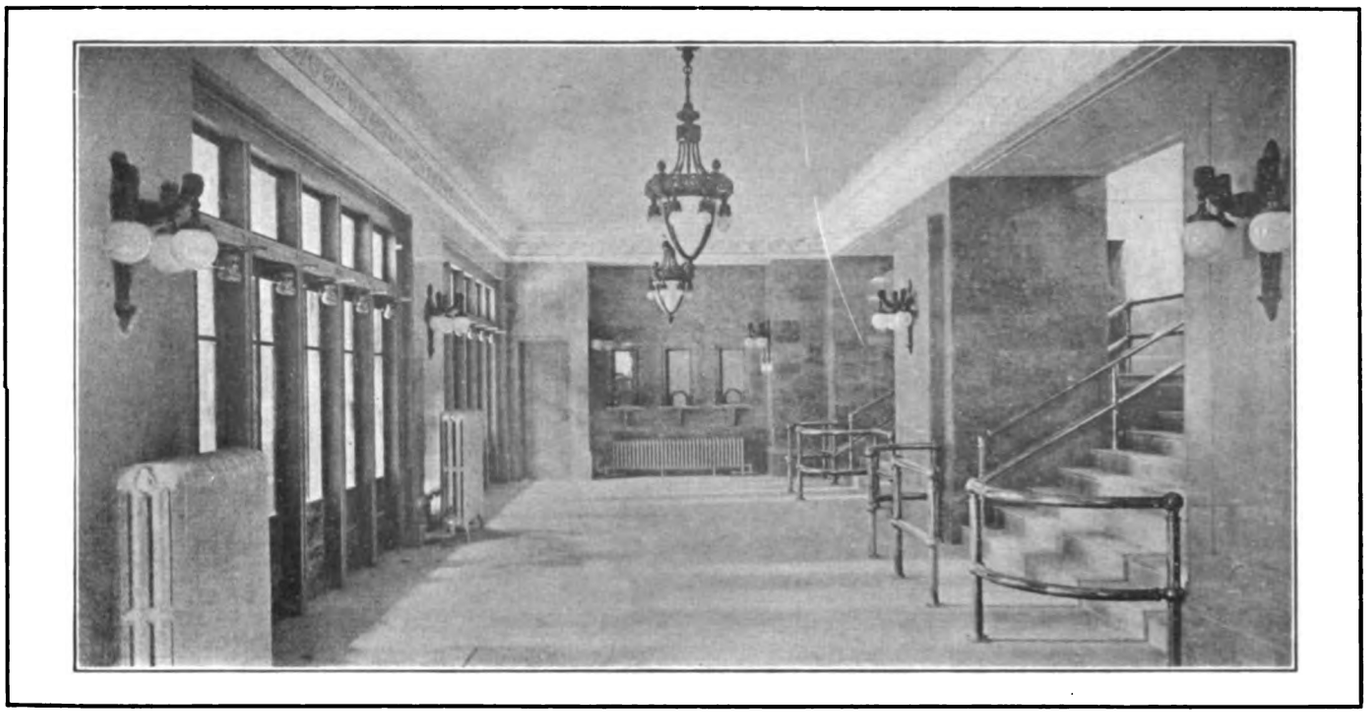
313A— Detroit Electric Appliance Company, Detroit, Mich. Deaco dynamos and equipment.

120— Gray & Davis, Amesbury, Mass. Gray & Davis lighting system.

*517— North East Electric Company, Rochester, N. Y. Lighting and self-starting systems.

*574— Ward Leonard Electric Company, Bronxville, N. Y. Automatic dynamo lighting systems.

*283— Willard Storage Battery Company, Cleveland, O. Elba lighting system.



Foyer and Main Entrance to Grand Central Palace at Lexington Avenue, Showing the Broad Staircases.

504— S. K. F. Ball Bearing Company, New York, N. Y. S. K. F. ball bearings.

162— Standard Roller Bearing Company, Philadelphia, Penn. Thrust ball bearings.

Carburetors.

174— Byrne, Kingston & Co., Kokomo, Ind. Kingston carburetors.

559— Findeisen & Kropf Manufacturing Company, Chicago, Ill. Rayfield carburetors.

235— Stromberg Motor Devices Company, Chicago, Ill. Stromberg carburetors.

145— Wheeler & Schebler, Indianapolis, Ind. Schebler carburetors.

Chains—Driving.

136— Baldwin Chain & Manufacturing Company, Worcester, Mass. Baldwin chains, sprockets.

Exhaust Horns.

*274— Gabriel Horn Manufacturing Company, Cleveland, O. Gabriel horns, shock absorbers.

*267— Gray-Hawley Manufacturing Company, Detroit, Mich. Autochimes, cut-outs, pedal valves, etc.

Gasoline Storage.

506— American Oil Pump & Tank Company, Dayton, O. Gasoline and lubricant storage systems.

190— S. F. Bowser & Co., Inc., Fort Wayne, Ind. Bowser fuel and lubricant tanks and pumps.

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*509—
Hydraulic Oil Storage Company, Detroit, Mich. Gasoline storage system.

173—
Janney, Steinmetz & Co., Philadelphia, Penn. Fuel and lubricant tanks and pumps.

550—
Wayne Oil Tank & Pump Company, Fort Wayne, Ind. Gasoline and lubricant storage systems.

Ignition Devices.

140—
Atwater Kent Manufacturing Works, Philadelphia, Penn. Unisparkers, ignition specialties, etc.

*261—
Briggs & Stratton Company, Milwaukee, Wis. Timers, switches, etc.

154—
Connecticut Telephone & Electric Company, Meriden, Conn. Electrical and ignition devices.

*259—
Herz & Co., New York, N. Y. Ignition specialties.

field, N. J. Rushmore lamps.

Lubricants.

217—
Columbia Lubricants Company of New York, New York, N. Y. Monogram oils and greases.

*266—
Adam Cook's Sons, New York, N. Y. Albany greases.

182—
Joseph Dixon Crucible Company, Jersey City, N. J. Graphited greases, graphite compounds.

162—
A. W. Harris Oil Company, Providence, R. I. Harris oils and greases.

232—
Havoline Oil Company, New York, N. Y. Havoline oils and greases.

*282—
George A. Haws, New York, N. Y. Panhard oils and greases.

257—
International Acheson Graphite Company, Niagara Falls, N. Y. Graphited oils, greases and compounds.

Magnetos.

258—
American Circular Loom Company, Aldeno, N. J. No-Lag magnetos.

218—
Bosch Magneto Company, New York, N. Y. Bosch magnetos and ignition specialties.

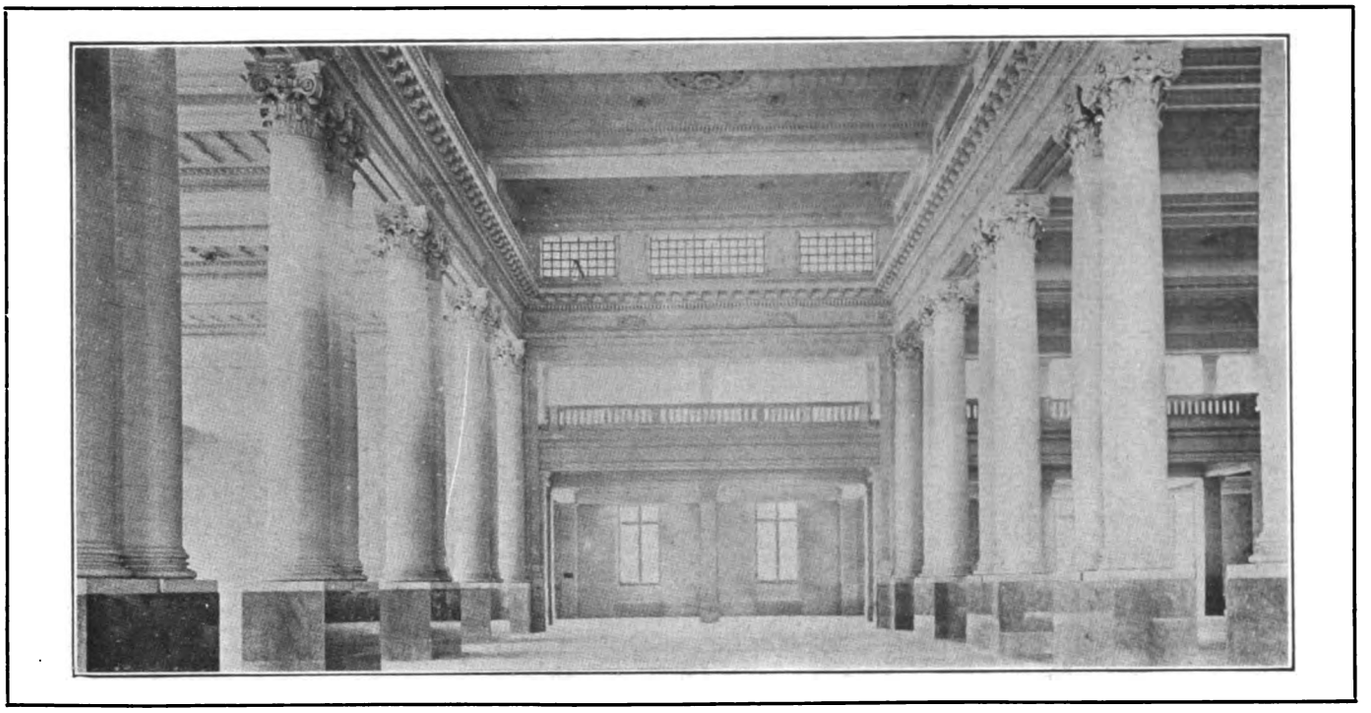
244—
Champion Ignition Company, Flint, Mich. Champion magnetos, spark plugs, etc.

154—
Connecticut Telephone & Electric Company, Meriden, Conn. Connecticut magnetos and electric specialties.

216—
Eisemann Magneto Company, New York, N. Y. Eisemann magnetos.

320—
General Electric Company, Schenectady, N. Y. Magnetos and electric specialties.

*270—
Heinze Electric Company, Lowell, Mass. Heinze magnetos and ignition specialties.



Section of the Main Hall, Grand Central Palace, Looking North Showing the Colonnade Effect and the Pairs of Decorative Pillars.

*613—
K-W Ignition Company, Cleveland, O. K-W system of ignition.

*624—
New York Coil Company, New York, N. Y. Rhoades unit spark ignition system.

167—
Pittsfield Spark Coil Company, Dalton, Mass. Timers, switches, coils, etc.

128—
C. F. Splitdorf, New York, N. Y. Coils, switches, etc.

Lamps, Headlights.

125—
Badger Brass Manufacturing Company, Kenosha, Wis. Solar head, dash and tail lamps.

181—
Edmunds & Jones Manufacturing Company, Detroit, Mich. E & J head, dash and tail lamps.

120—
Gray & Davis, Amesbury, Mass. Gray & Davis automobile lamps, lighting systems.

*285—
Rushmore Dynamo Works, Plain-

598—
Keystone Lubricating Company, Philadelphia, Penn. Keystone oils and greases.

*618—
William P. Miller's Sons, Long Island City, N. Y. Pan-O-Lite oils and greases.

141—
New York & New Jersey Lubricants Company, New York, N. Y. Motorol oils and Non-Fluid greases.

*521—
L. Sonneborn Sons, New York, N. Y. Amalie oils.

246—
Texas Company, New York, N. Y. Texco oils and lubricants.

188—
Vacuum Oil Company, Rochester, N. Y. Mobiloil.

*288—
White & Bagley Company, Worcester, Mass. Oilzum oils and greases.

*313—
Wolverine Lubricants Company, New York, N. Y. Packard oils and greases.

*259—
Herz & Co., New York, N. Y. Herz magnetos, spark plugs, ignition specialties.

252—
Jacobson - Brandow Company, Pittsfield, Mass. J-B magnetos and ignition specialties.

537—
Marburg Brothers, New York, N. Y. Mea magnetos.

*263—
National Coil Company, Lansing, Mich. Magnetos, coils and ignition apparatus.

167—
Pittsfield Spark Coil Company, Dalton, Mass. Pittsfield magnetos, spark plugs, ignition specialties.

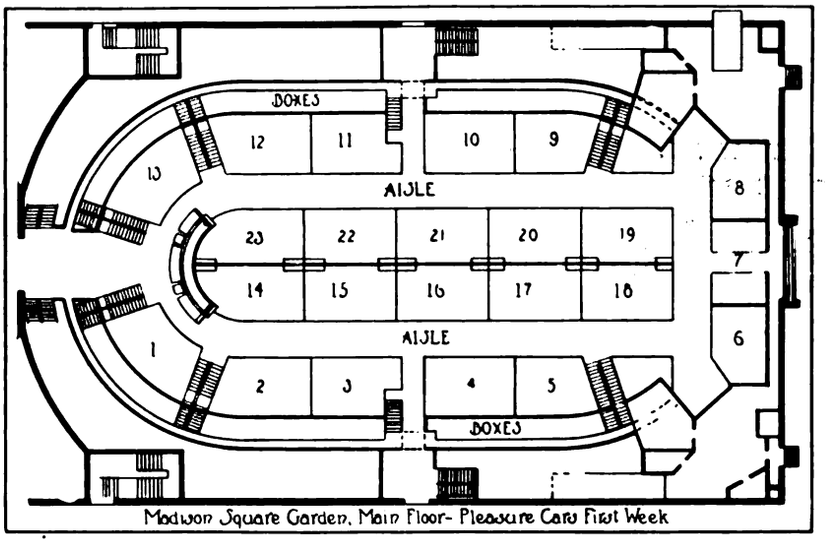
146—
Remy Electric Company, Anderson, Ind. Remy magnetos and electric specialties.

128—
C. F. Splitdorf, New York, N. Y. Splitdorf magnetos, spark plugs and ignition specialties.

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Metal Specialties.

184— Chandler Company, Springfield, Mass. Hub caps, name plates, etc.



Madison Square Garden, Main Floor—Pleasure Cars First Week

185— Columbia Nut & Bolt Company, Inc., Bridgeport, Conn. Lock nuts.

160— Hartford Machine Screw Company, Hartford, Conn. Screws, nuts and milled and turned parts.

158— Turner Brass Works, Sycamore, Ill. Automobile fittings and hardware.

Metal Tool Boxes, Etc.

*219— Haves Manufacturing Company, Detroit, Mich. Metal battery and tool boxes, etc.

Publications.

394— Automobile Journal Publishing Company, Pawtucket, R. I. Automobile Journal, Motor Truck, Accessory & Garage Journal.

701— Bicycling World Company, New York, N. Y.

600— Chilton Company, Philadelphia, Penn. Cycle and Automobile Trade Journal, Commercial Car Journal.

546— Class Journal Publishing Company, New York, N. Y. Automobile.

545— Class Journal Publishing Company, New York, N. Y. Motor Age.

597— Horseless Age Company, New York, N. Y. Horseless Age.

706— Motorcycling, Chicago, Ill.

711— Motorcycle Publishing Company, New York, N. Y.

*556— New Publication Company, New York, N. Y. Motor.

*560— Motor Vehicle Publishing Company, New York, N. Y. Automobile Dealer and Repairer.

505— Motor World Publishing Company, New York, N. Y. Motor World.

**556— Power Wagon Publishing Company, Chicago, Ill. Power Wagon.

Radiators.

*595— A-Z Company, New York, N. Y. Radiators, sheet metal products.

186— Briscoe Manufacturing Company, Detroit, Mich. Radiators, sheet metal products.

*578— El Arco Radiator Company, New York, N. Y. El Arco radiators.

*515— Fedders Manufacturing Company, Buffalo, N. Y. Fedders radiators.

220A— Harrison Radiator Company, Lockport, N. Y. Harrison radiators.

151— McCord Manufacturing Company, Detroit, Mich. Radiators, gaskets, fans, etc.

**564— W. J. Kells Manufacturing Company, New York, N. Y. Kells radiators.

Roller Bearings.

253— Bower Roller Bearing Company, Detroit, Mich. Bower roller bearings.

131— Hyatt Roller Bearing Company, Newark, N. J. Hyatt roller bearings.

163— Standard Roller Bearing Company, Philadelphia, Penn. Standard roller bearings.

165— Timken Roller Bearing Company, Canton, O. Timken roller bearings.

Shock Absorbers.

502— Aristos Company, New York, N. Y. Mondex shock absorbers.

533— John W. Blackledge Manufacturing Company, Chicago, Ill. Velvet auxiliary springs.

*609— Ernst Flentje, Cambridge, Mass. Flentje shock absorbers.

156— Hartford Suspension Company, Jersey City, N. J. Hartford shock absorbers and auto jacks.

547— J M Shock Absorber Company, Philadelphia, Penn. J M shock absorbers.

*269— J. H. Sager Company, Rochester, N. Y. Sager equalizing springs, etc.

535— S & S Shock Absorber Company, Washington, D. C. S & S shock absorbers.

*530— Westen Manufacturing Company, Newark, N. J. Westen shock absorbers.

Spark Plugs, Etc.

249— Benford Manufacturing Company, Mount Vernon, N. Y. Spark plugs, timers and ignition specialties.

*402— Best Ignition Equipment Company, New York, N. Y. Best spark plugs.

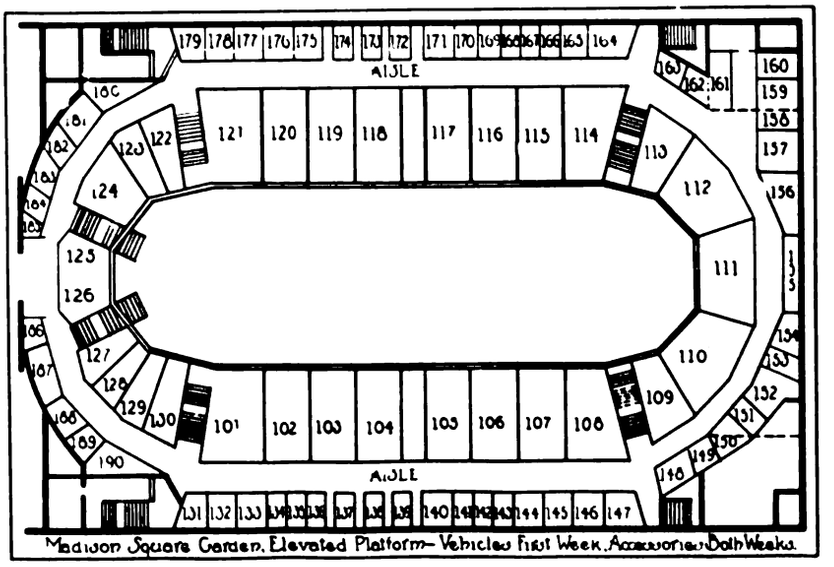
218— Bosch Magneto Company, New York, N. Y. Bosch spark plugs, etc.

244— Champion Ignition Company, Flint, Mich. Champion spark plugs, etc.

*404— Duplex Magneto & Spark Plug Company, Brooklyn, N. Y.

134— R. E. Hardy Company, Chicago, Ill. Sta-Rite, Venus and Vulcan spark plugs.

*258— Herz & Co., New York, N. Y. Herz spark plugs, etc.



Madison Square Garden, Elevated Platform—Vehicles First Week, Accessories Both Weeks

173— Janney, Steinmetz & Co., Philadelphia, Penn. Flashlight spark plugs.

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*567—
Jeffrey, DeWitt & Co., Detroit, Mich. Reliance spark plugs.
180—
A. R. Mosler & Co., New York, N. Y. Spitfire, Triumph and Broochblock spark plugs.
167—
Pittsfield Spark Coil Company, Dalton, Mass. Jewell spark plugs.
128—
C. F. Splitdorf, New York, N. Y. Splitdorf spark plugs, etc.

Speedometers.

189—
Hoffecker Company, Boston, Mass. Hoffecker speedometers.
143—
Jones Speedometer Company, New York, N. Y. Jones speedometers, recorders, gasoline gauges, hub odometers, live map meters.
247—
Standard Thermometer Company, Boston, Mass. Standard speedometers.
*405—
Star Speedometer Company, Melton, Penn. Star speedometers.
227—
Stewart & Clark Manufacturing Company, Chicago, Ill. Stewart speedometers.
123—
Veeder Manufacturing Company, Hartford, Conn. Hub odometers, cyclometers, tachodometers, counters, die castings.
150—
Warner Instrument Company, Beloit, Wis. Warner auto-meters, speed registers, etc.

Steel and Iron Castings.

284—
Isaac G. Johnson & Co., New York, N. Y. Steel and malleable iron castings.
230—
Treadwell Engineering Company, Lebanon, Penn. Steel castings, electrically made.

Steels and Metals.

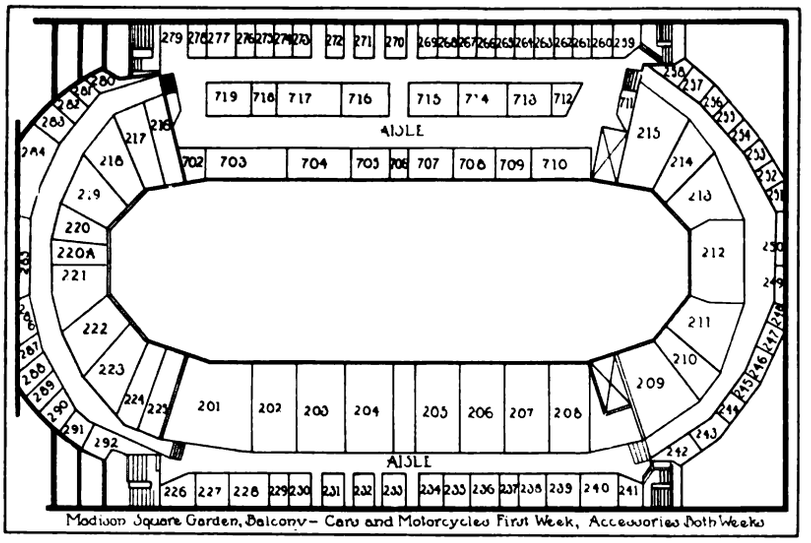
503—
American Bronze Company, Berwyn, Penn. Non-Gran bronze products.
541—
American Vanadium Company, Pittsburg, Penn. Vanadium metal products.
544—
Carnegie Steel Company, Pittsburg, Penn. Special construction steels.
240—
Crucible Steel Company of America, Pittsburg, Penn. Steel and special metals.
540—
Peter A. Frasse & Co., New York, N. Y. Shelby steel tubing.
599—
Thomas Prosser & Son, New York, N. Y. Krupp steel products.
*507—
United Steel Company, Canton, O. Vanadium steels.
**309—
United Steel Company, Canton, O. Special steel alloys.
311—
Vanadium Metals Company, Pittsburg, Penn. Vanadium alloys.

Steel Stampings.

*271—
Globe Machine & Stamping Company, Cleveland, O. Hangers, brackets, etc.

Steering Gears.

307—
Gemmer Manufacturing Company, Detroit, Mich. Steering gears.
*318—
Jackson - Church - Wilcox Company, Saginaw, Mich. Jaco steering gears.
**314—
Ross Gear & Tool Company, Lafayette, Ind. Steering gears.

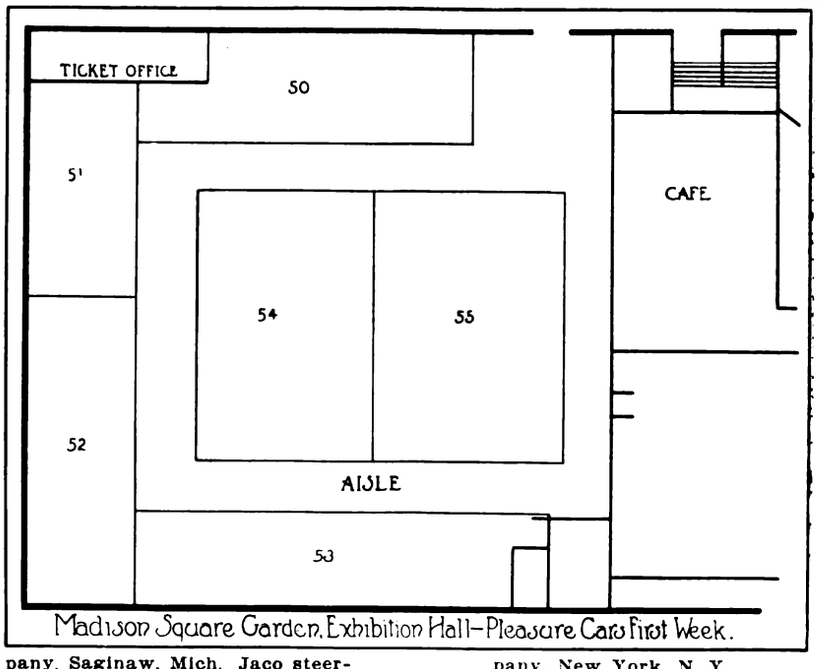


Storage Batteries.

516—
Dayton Engineering Laboratories Company, Dayton, O. Delco Ignition system.
237—
Edison Storage Battery Company, West Orange, N. J. Edison vehicle and ignition batteries.
183—
Electric Storage Battery Company, Philadelphia, Penn. Exide vehicle and ignition batteries.
*612—
Geiszler Bros. Storage Battery Company, New York, N. Y. Geiszler batteries.
427—
Gould Storage Battery Company, New York, N. Y. Gould storage batteries.
585—
Niagara Lead & Battery Company, Niagara Falls, N. Y. Salom storage batteries.
**565—
Philadelphia Storage Battery Company, Philadelphia, Penn. Philadelphia vehicle batteries.
144—
United States Lighting and Heating Company, New York, N. Y. National lighting and ignition batteries.
*268—
Vesta Accumulator Company, Chicago, Ill. Vesta accumulators.
*283—
Willard Storage Battery Company, Cleveland, O. Lighting and ignition batteries.

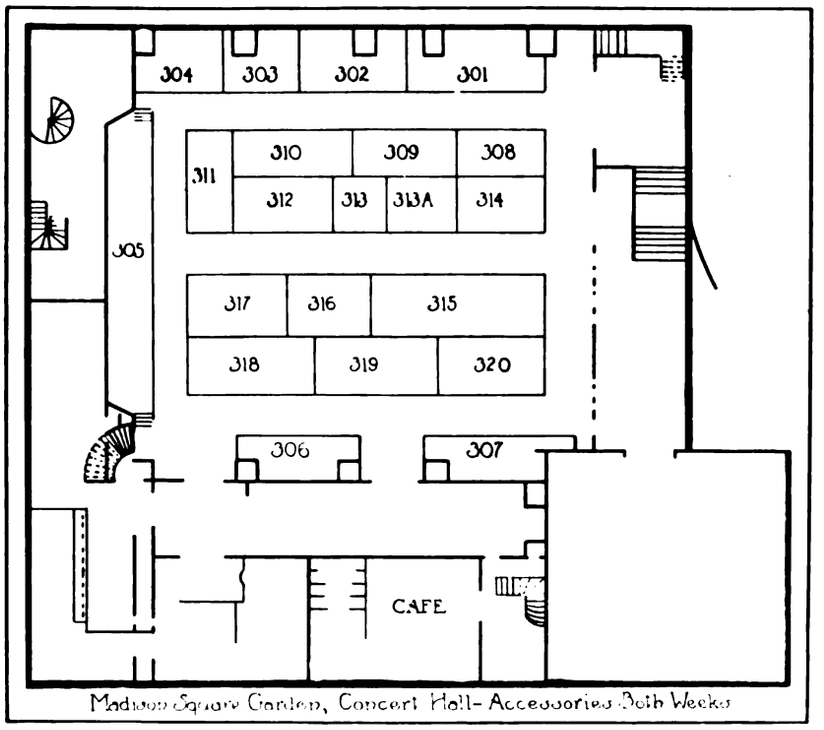
Tires, Tubes and Rims.

151—
Ajax-Grieb Rubber Company, New York, N. Y. Ajax tires and tubes.
*300—
Batavia Rubber Company, Batavia, N. Y. Batavia tires and tubes.
152—
Consolidated Rubber Tire Company, New York, N. Y. Kelly-Springfield tires and tubes.
*277—
Continental Rubber Works Company, Erie, Penn.
127—
Diamond Rubber Company, Akron, O. Diamond tires and tubes.
*413—
Endurance Tire & Rubber Company, New York, N. Y.
164—
Firestone Tire & Rubber Company, Akron, O. Firestone tires, tubes and rims.



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122— Fisk Rubber Company, Chicopee Falls, Mass. Fisk tires, tubes and rims.



Madison Square Garden, Concert Hall—Accessories Both Weeks

222— Federal Rubber Manufacturing Company, Cudahy, Wis. Federal tires and tubes.

130— Goodyear Tire & Rubber Company, Akron, O. Goodyear tubes, tires and rims.

501— James L. Gibney & Bro, Philadelphia, Penn. Gibney tires and vulcanizers.

126— B. F. Goodrich Company, Akron, O. Goodrich tires and tubes.

*525— Hardman Tire & Rubber Company, New York, N. Y.

225— J. Ellwood Lee Company, Conshohocken, Penn. Jelco tires and tubes.

228— Michelin Tire Company, Milltown, N. J. Michelin tires, tubes and rims.

234— Motz Clincher Tire & Rubber Company, Akron, O. Motz tires.

*242— National Rubber Company, St. Louis, Mo.

*426— New Jersey Car Spring & Rubber Company, Jersey City, N. J. Caprinco tires and tubes.

147— Pennsylvania Rubber Company, Jeannette, Penn. Pennsylvania tires and tubes.

*570— Prince Tire Company, New York, N. Y.

148— Republic Rubber Company, Youngstown, O. Republic tires and tubes.

290— Russian Tire Company, New York, N. Y.

*512— Shawmut Tire Company, Boston, Mass. Shawmut tires and tubes.

*582— Standard Tire & Rubber Company, Boston, Mass.

*286— Stein Double Cushion Tire Company, Akron, O. Stein double cushion tires.

171— Swinehart Tire & Rubber Company, Akron, O. Swinehart tires and tubes.

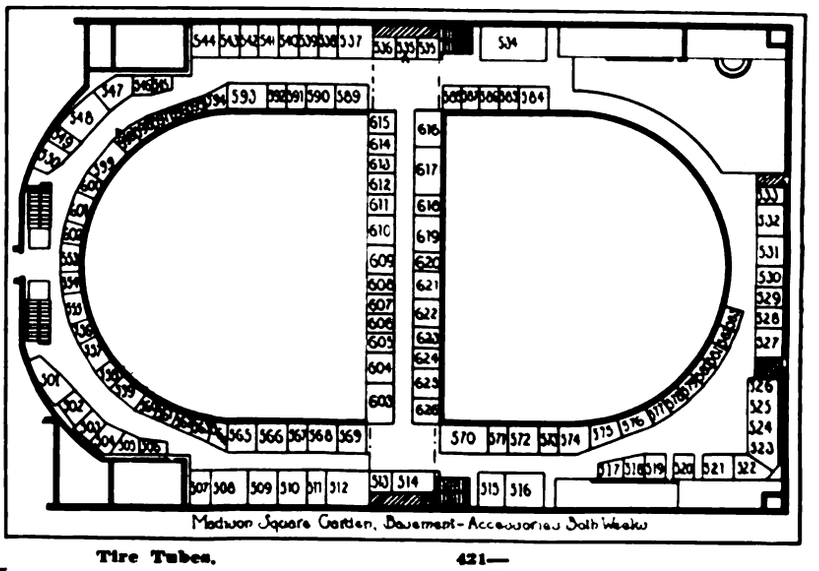
124— United States Tire Company, New York, N. Y. Hartford, Continental, G & J and Morgan & Wright tires and tubes.

Tire Protectors.

*317— Double Fabric Tire Company, Auburn, Ind. Interlock inner tires, etc.

231— Leather Tire Goods Company, Niagara Falls, N. Y. Woodworth treads, tire sleeves, etc.

*527— Standard Tire Protector Company, Indianapolis, Ind. Standard tire protectors.



Madison Square Garden, Basement—Accessories Both Weeks

Tire Tubes.

*275— Seamless Rubber Company, New Haven, Conn. Seamless (Kantleak) tubes.

*303— Voorhees Rubber Manufacturing Company, Jersey City, N. J. Tubes and repairing material.

Transmissions, Etc.

169— Brown-Lipe Gear Company, Syracuse, N. Y. Gears, transmissions, axles, etc.

226— Covert Motor Vehicle Company, Lockport, N. Y. Covert transmissions.

590— Lefever Arms Company, Syracuse, N. Y. Lefever transmissions, jackshafts, etc.

548— Merchant & Evans Company, Philadelphia, Penn. Transmissions, jackshafts, clutches, etc.

*280— McCue Company, Buffalo, N. Y. Axles, transmissions, etc.

239— Muncie Gear Works, Muncie, Ind. Transmissions, jackshafts, brake drums, differentials.

176— Warner Gear Company, Muncie, Ind. Transmissions, differentials, steering gears.

236— Warner Manufacturing Company, Toledo, O. Transmissions, differentials, steering gears.

Wheel Rims.

117— Standard Welding Company, Cleveland, O. Wheel rims.

315— United Rim Company, Akron, O. Wheel rims.

Windshields.

*573— Auto Wind Shield Company, Cambridge, Mass.

*310— Cox Brass Manufacturing Company, Albany, N. Y. Clear vision windshields.

*248— Eagle Company, Newark, N. J. Eagle windshields.

*604— Garage Equipment Company, Milwaukee, Wis. Gemco windshields, bumpers, etc.

*628— Emil Grossman Company, New York, N. Y. Swivelaction windshields.

*575— Ideal Wind Shield Company, New York, N. Y. Ideal windshields.

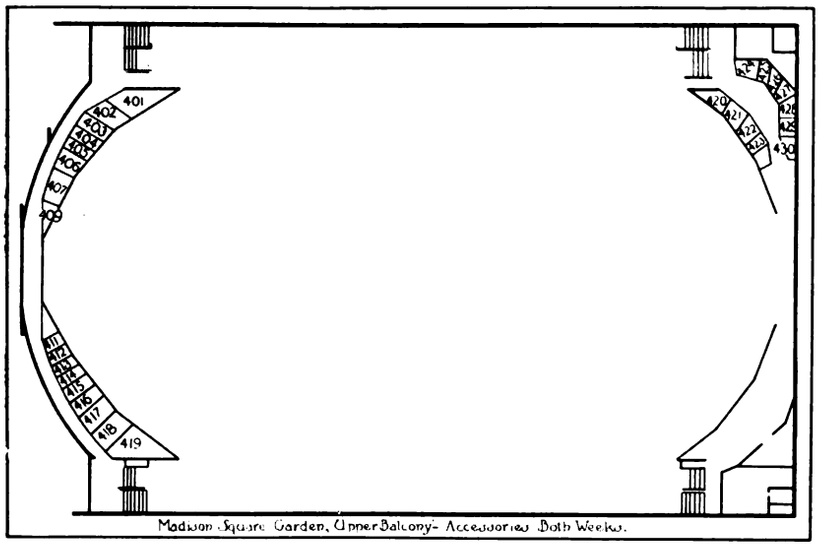
421— Metal Stamping Company, Long Island City, N. Y.

135— C. A. Mezger, Inc., New York, N.

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Y. Mezger windshields.

568—
Polson Manufacturing Company, Buffalo, N. Y.



Madison Square Garden, Upper Balcony—Accessories Both Weeks.

*301—
Sprague Umbrella Company, Norwalk, O. Sprague windshields.

*508—
Troy Carriage Sun Shade Company, Troy, O. Troy windshields.

*610—
Union Auto Specialties Company, Brookville, Penn. Union automatic windshields.

*625—
Vanguard Manufacturing Company, Joliet, Ill. Vanguard windshields.

Wood and Metal Products.

*302
Hess Spring & Axle Company, Carthage, O. Springs, axles.

137—
Phineas Jones & Co., Newark, N. J. Wood wheels.

*276—
Manufacturers Foundry Company, Waterbury, Conn. Iron castings.

139—
National Tube Company, Pittsburg, Penn. Shelby seamless steel tubes.

149—
A. O. Smith Company, Milwaukee, Wis. Pressed steel frames, parts, etc.

168—
Spicer Manufacturing Company, Plainfield, N. J. Universal joints.

Miscellaneous Components.

255—
Buda Company, Harvey, Ill. Motors.

187—
William Cramp & Sons Ship & Engine Building Company, Philadelphia, Penn. Bronze and bearing metals.

*265—
C. Cowles & Co., New Haven, Conn. Automobile fittings and hardware.

133—
Light Manufacturing & Foundry Company, Pottstown, Penn. Aluminum castings.

238—
Royal Equipment Company, Bridgeport, Conn. Raymond brakes, Raybestos brake lining.

308—
Sparks-Withington Company, Jackson, Mich. Pressed metal parts.

Miscellaneous.

*003—
Ajax Trunk & Sample Case Company, New York, N. Y. Automobile trunks and luggage carriers.

*526—
J. Alexander Manufacturing Company, New York, N. Y.

*314—
Allen Automobile Specialty Company, New York, N. Y. Fabric specialties, pressure gauges, etc.

423—
American Taximeter Company, New York, N. Y.

551—
James R. Ashley, New York, N. Y.

*281—
Auburn Auto Pump Company, Boston, Mass. Automobile tire pumps.

*422—
Auto Specialty Company, Toledo, Ohio.

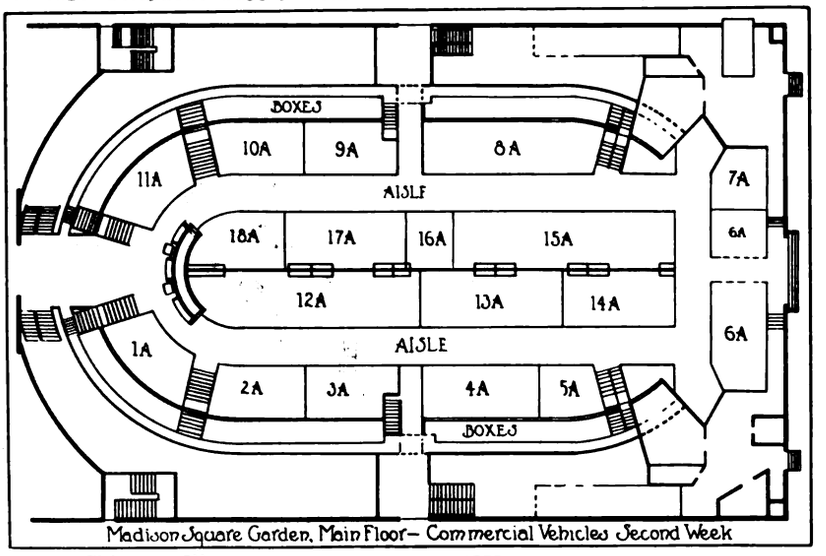
555—
C. R. Barker & Co., Ltd., New York, N. Y.

*611—
Brown Company, Syracuse, N. Y. Pumps, pressure gauges, etc.

*607—
Calmon Asbestos & Rubber Works, New York, N. Y. Tire tubes, packing, brake lining, etc.

*531—
F. S. Carr Company, Boston, Mass. Top and slip cover fabrics.

241—
Chicago Telephone Supply Company, Chicago, Ill.



Madison Square Garden, Main Floor—Commercial Vehicles Second Week

*605—
Clucker & Hixon Company, New York, N. Y.

*563—
C. M. B. Company, Syracuse, N. Y. Automobile wrenches.

155—
Coes Wrench Company, Worcester, Mass. Coes wrenches.

592—
C. J. Cross & Co., New York, N. Y.

*572—
Frank H. Cross Company, New York, N. Y. Lamps, robe rails, etc.

*571—
Culver, Stearns Manufacturing Company, Worcester, Mass. Electric lamp lighting equipments.

*569—
Smalley Daniels, Boston, Mass. Automobile specialties.

250—
Detroit Lubricator Company, Detroit, Mich. Detroit mechanical oilers.

*608—
Donnelly Motor Equipment Company, New York, N. Y.

*310—
Doehler Die Casting Company, Brooklyn, N. Y. Die cast parts.

*287—
Dover Stamping & Manufacturing Company, Cambridge, Mass. Stamped sheet metal specialties.

*606—
John L. G. Dykes Company, Chicago, Ill. Tire specialties.

*304—
Esterline Company, Lafayette, Ind. Lighting system.

602—
J. Eavenson & Sons, Inc., Camden, N. J.

*576—
H. A. Elliott, Detroit, Mich. Imported metal forgings.

159—
English & Mersick Company, New Haven, Conn. Automobile hardware and metal specialties.

*518—
Essex Rubber Company, Inc., Trenton, N. J.

*417—
E Z Way Motor Grease Company, New York, N. Y.

406—
L. V. Fletcher & Co., New York, N. Y.

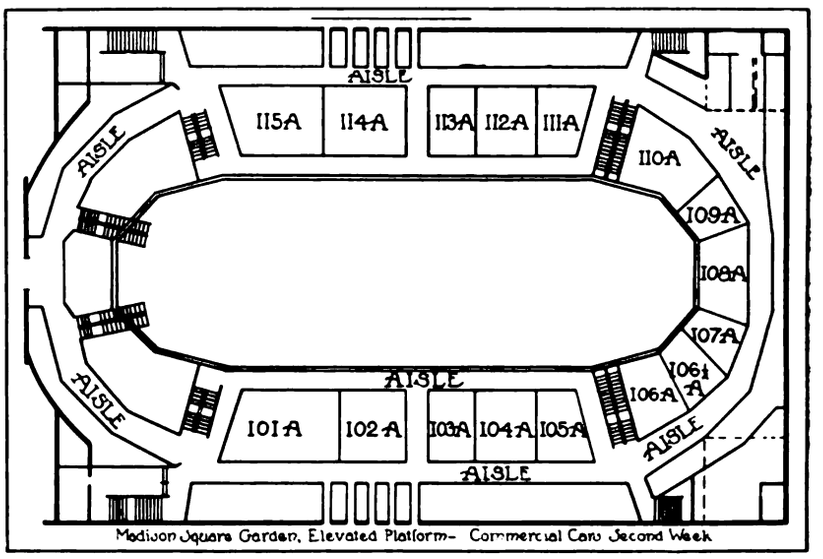
*589—
H. H. Franklin Manufacturing Company, Syracuse, N. Y. Die cast metal specialties.

*529—
Gardner Engine Starter Company, Chicago, Ill.

*273—
Gilbert Manufacturing Company, New Haven, Conn. Fabric automobile accessories.

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561— M. S. Gilmer, New York, N. Y.
*524— Gray Specialty Company, Newark, N. J.
*528— F. A. Hardy & Co., New York, N. Y.
*579— Hawthorne Manufacturing Company, Bridgeport, Conn. Four-cylinder automobile tire pumps.
*262— Hodgman Rubber Company, New York, N. Y.
*622— R. M. Hollingshead Company, Camden, N. J. Soaps and metal polish.
601— Homo Company of America, Philadelphia, Penn. Gasoline fuel economizer.
418— H. J. Houpert, New York, N. Y.
549— Ignition Starter Company, Detroit, Mich. Disco motor car starter.
*513— International Metal Polish Company, Indianapolis, Ind. Soaps and metal polish.
*291— Kellogg Manufacturing Company, Rochester, N. Y. Four-cylinder air pumps.
*428— William R. Laidlaw, Jr., New York, N. Y. Cloth and carpet trimmings.
552— F. T. McGinnis, New York, N. Y.
553— Mead Engine Company, Dayton, O.
*520— Meteor Auto Tank Company, New York, N. Y. Meteor gas tanks.
161— Charles E. Miller, New York, N. Y. Parts, accessories and supplies.
562— Modern Auto Appliance Company, Chatham, N. Y. "Little Steersman."
*565— Morrison-Ricker Company, Grinnell, Ia. "Rist-fit" motoring gloves.
*581— Frank Mossberg, Attleboro, Mass. Mossberg wrenches.
*617— Motor Car Equipment Company, New York, N. Y. Motor car accessories.
*616— L. J. Mutty Company, Boston, Mass. Top and slip cover fabrics.
598A— Mutual Auto Accessories Company, New York, N. Y.
411— Narragansett Chemical Company, Providence, R. I. Storage batteries, lubricants, oils, polishes.
*415— George Nash Company, New York, N. Y.
*621— Nathan Novelty Manufacturing Company, New York, N. Y. Fabric automobile accessories.
591— New Miller Manufacturing Company, Los Angeles, Cal.
251— New York Sporting Goods Company, New York, N. Y. Automobile accessories and specialties.
561— New York X-Ray Sales Company, Syracuse, N. Y.
*278— Noera Manufacturing Company, Waterbury, Conn. Noera pumps.
*514— A. S. Noonan Tool & Machine Works, Rome, N. Y. Noonan automobile tools and specialties.
*319— Northway Motor & Manufacturing Company, Detroit, Mich. Northway gasoline motors.
172— Oliver Manufacturing Company, Chicago, Ill. Jacks.
221— Pantasote Company, New York, N. Y. Pantasote fabrics.
416— Paragon Auto Parts Manufacturing Company, New York, N. Y.
*403— Perfect Window Regulator Company, New York, N. Y.
542— Perfection Spring Company, Cleveland, O. Vanadium and Krupp steel springs.
*316— G. Piel Company, New York, N. Y. Automobile horns.
566— P. Reilly & Son Corporation, Newark, N. J. Leather products.
*623— Riley-Klotz Manufacturing Company, Newark, N. J. Automobile and motorcycle horns.
*279— Rose Manufacturing Company, Philadelphia, Penn. Light and number brackets.
*264— C. A. Shaler, Waupun, Wis. Portable vulcanizers.
557— Simonds Manufacturing Company, Fitchburg, Mass. Saws and steel clutch discs.
535A— Smith Gasoline Meter Company, New York, N. Y. Gasoline meters.
*428— Grant E. Smith, Poughkeepsie, N. Y.
554— Senora Motor Horn Company, New York, N. Y.
*312— F. W. Spacke Machine Company, Indianapolis, Ind. Automobile parts, bearings, air compressors.
*584— Sphinx Motor Company, New York, N. Y.
*614— S. R. B. Specialty Company, East Orange, N. J. Cut-out valves.
*583— John T. Stanley, New York, N. Y. Soaps and polishes.
306— Start-Lite Company, Chicago, Ill. Gas lighting system.
*619— Stevens & Co., New York, N. Y. Copper tube connections.
538— Andrew C. Thompson Auto Company, Plainfield, N. J.
*407— C. O. Tingley, Rahway, N. J. Tire repair specialties.
536— Joseph Tracey, New York, N. Y. Dynamometers.
*511— Charles H. Tucker Company, New York, N. Y.
*523— Tucker Tool & Machine Company, New York, N. Y.
*532— U. S. Auto Horn Company, New York, N. Y.
*272— Valentine & Co., New York, N. Y. Automobile varnishes.
409— Van Auken Indicator Company, New York, N. Y.
*557— Vaum's Castorine Company, Rome, N. Y.
*412— Velox Polish Manufacturing Company, New York, N. Y.
*580— Warburg Rim Company, Detroit, Mich.
430— Wasson Piston Ring Company, Bayonne, N. J.
*620— C. A. Willey Company, Long Island City, N. Y. Paints and oils.
153— Orlando W. Young, Newark, N. J. Tire repair outfits, soaps, polishes, etc.



Madison Square Garden, Elevated Platform— Commercial Cars Second Week

*Will exhibit first week only. First week, Part I, the Pleasure Car Show.

**Will exhibit second week only. Second week, Part II, the Power Wagon Show.

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Motorcycles—First Week.

712—
Eclipse Manufacturing Company, Elmira, N. Y.

713—
Emblem, Emblem Manufacturing Company, Angola, N. Y.

707—
Excelsior, Excelsior Supply Company, Chicago, Ill.

717—
Flanders, Flanders Manufacturing Company, Pontiac, Mich.

716—
Harley-Davidson, Harley-Davidson Motor Company, Milwaukee, Wis.

709—
Henderson, Henderson Motorcycle Company, Detroit, Mich.

703—
Indian, Hendee Manufacturing Company, Springfield, Mass.

715—
Merkel, Miami Cycle & Manufacturing Company, Middletown, O.

702—
Minneapolis, Minneapolis Motor Cycle Company, Minneapolis, Minn.

718—
M-M, American Motor Company, Brockton, Mass.

714—
New Era, New Era Auto Cycle Company, Dayton, O.

705—
Pierce, Pierce Cycle Company, Buffalo, N. Y.

719—
Pope, Pope Manufacturing Company, Hartford, Conn.

710—
R-S, Reading Standard Company, Reading, Penn.

708—
Thor, Aurora Automatic Machinery Company, Aurora, Ill.

704—
Yale, Consolidated Manufacturing Company, Toledo, O.

CLASSIFIED LIST OF EXHIBITORS AT GRAND CENTRAL PALACE SHOW.

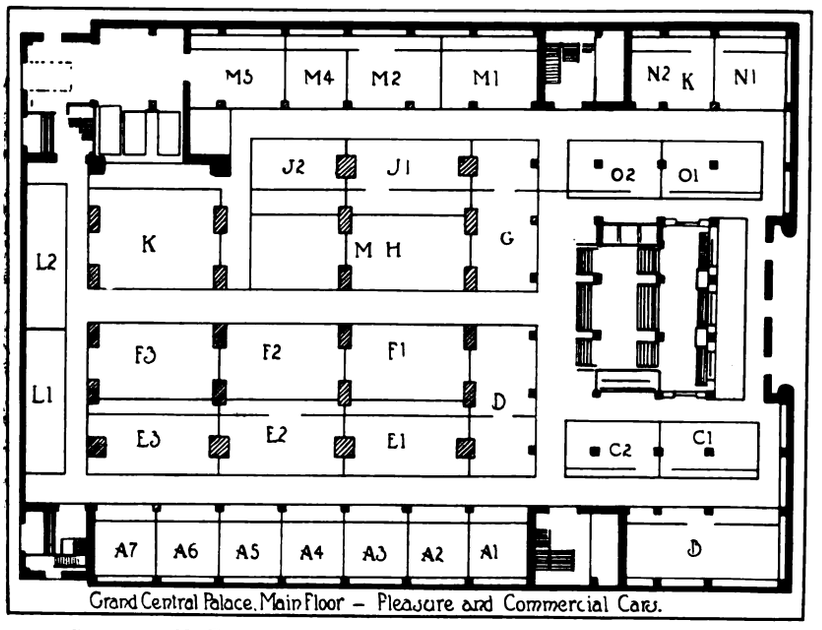
COMMERCIAL WAGONS.

SF L3—
Argo, Argo Electric Vehicle Company, Saginaw, Mich.

SF E2—
Atterbury, Atterbury Motor Car Company, Buffalo, N. Y.

SF C2—
Bowling Green Motor Car Company, Bowling Green, O.

SF A3—
Chase, Chase Motor Truck Company, Syracuse, N. Y.



Grand Central Palace. Main Floor — Pleasure and Commercial Cars.

SF G—
Commer, Wyckoff, Church & Partridge, New York, N. Y.

SF D2—
Correja, Vandawater & Co., Elizabeth, N. J.

SF J2—
Cortland, Cortland Motor Wagon Company, Pittsfield, Mass.

SF M1—
Dart Manufacturing Company, Waterloo, Ia.

SF L1—
Dayton, Dayton Auto Truck Company, Dayton, O.

SF K4—
Decatur, Decatur Motor Car Company, Decatur, Ind.

SF K1—
Durant-Dort, Durant-Dort Carriage Company, Flint, Mich.

SF K2—
Eclipse, Eclipse Truck Company, Franklin, Penn.

SF H5—
Federal, Federal Motor Truck Company, Detroit, Mich.

MF M1—
Gramm, Gramm Motor Truck Company, Lima, O.

MF M2—
Kelly, Kelly Motor Truck Company, Springfield, O.

SF L2—
Lauth-Juergens, Lauth-Juergens Motor Car Company, Fremont, O.

SF J3—
Lippard-Stewart, Lippard-Stewart Motor Car Company, Buffalo, N. Y.

SF J4—
Maxim, G. H. Bushnell Press Company, Thompsonville, Conn.

SF K3—
Motor Wagon, Motor Wagon Company, Detroit, Mich.

SF B2—
Newark, Newark Auto Manufacturing Company, Newark, N. J.

SF J5—
New York, Atlantic Motor Truck Company, New York, N. Y.

SF H7—
Packers, Packers Motor Truck Company, Wheeling, W. Va.

SF C3—
Progress Development Company, New York, N. Y.

SF B3—
Sanbert, Sanford-Herbert Company, Syracuse, N. Y.

SF B1—
Sanford, L. E. Schlatterback Manufacturing Co., East Orange, N. J.

SF H4—
Schacht, Schacht Motor Car Company, Cincinnati, O.

SF F2—
Smith, A. O. Smith Company, Milwaukee, Wis.

SF H1—
Standard, Standard Electric Car Company, Jackson, Mich.

SF J1—
Sullivan, Sullivan Motor Car Company, Rochester, N. Y.

SF H2—
Stuyvesant Motor Car Company, Cleveland, O.

SF A4—
Universal, Universal Motor Truck Company, Detroit, Mich.

SF D3—
Veerac, Veerac Sales Company, Paterson, N. J.

SF C1—
Velie, Velie Motor Vehicle Company, Moline, Ill.

SF H3—
Walker, Walker Vehicle Company, Chicago, Ill.

SF F1—
Walter, Walter Motor Truck Manufacturing Co., New York.

PLEASURE CARS.

MF K—
Abbott-Detroit, Abbott Motor Company, Detroit, Mich.

MF M4—
Auburn, Auburn Automobile Company, Auburn, Ind.

SF A6—
Bergdoll, L. J. Bergdoll Motor Company, Philadelphia, Penn.

MF L1—
Cino, Haberer & Co., Cincinnati, O.

MF F1—
Cole, Cole Motor Car Company, Indianapolis, Ind.

MF A2—
Cutting, Clarke-Carter Automobile Company, Jackson, Mich.

MF M5—
De Tamble, De Tamble Motors Company, Anderson, Ind.

MF D—
Fiat, Fiat Automobile Company, New York, N. Y.

MF J2—
Firestone-Columbus, Columbus Buggy Company, Columbus, O.

MF O2—
Great Western, Great Western Automobile Company, Peru, Ind.

SF H6—
Herreshoff, Herreshoff Motor Company, Detroit, Mich.

MF F2—
Hupmobile, Hupp Motor Car Company, Detroit, Mich.

MF A3—
Imperial, Imperial Automobile Company, Jackson, Mich.

SF A7—
King, King Motor Car Company, Detroit, Mich.

MF J1—
Kline Kar, Kline Motor Car Company, York, Penn.

MF E3—
K-R-I-T, K-R-I-T Motor Car Company, Detroit, Mich.

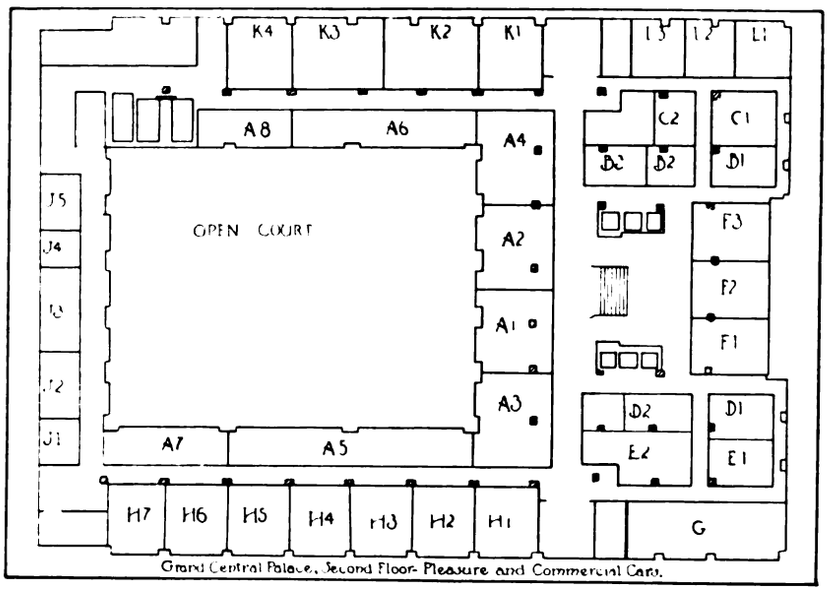
MF N2—
Lion, Lion Motor Car Company, Adrian, Mich.

SF D1—
Marathon, Marathon Motor

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Works, Nashville, Tenn.

MF E1—
Marion, Marion Motor Sales Company, Indianapolis, Ind.



Grand Central Palace, Second Floor-Pleasure and Commercial Cars.

MF O1—
McFarlan, McFarlan Motor Car Company, Connersville, Ind.

SF A8—
Metz, Metz Company, Waltham Mass.

MF N1—
Middleby, Middleby Automobile Company, Reading, Penn.

MF A4—
Ohio Electric, Ohio Electric Car Company, Toledo, O.

MF A7—
Paterson, W. A. Paterson Company, Flint, Mich.

MF C2—
Paige-Detroit, Paige-Detroit Motor Car Company, Detroit, Mich.

MF L2—
Penn, Penn Motor Car Company, Pittsburg, Penn.

MF H—
Rambler, Thomas B. Jeffery Company, Kenosha, Wis.

MF G—
Regal, Regal Motor Car Company, Detroit, Mich.

MF B—
R. C. H., Hupp-Yeats, Hupp Corporation, Detroit, Mich.

MF E2—
Stutz, Ideal Motor Car Company, Indianapolis, Ind.

MF A5-6—
Velie, Velie Motor Vehicle Company, Moline, Ill.

MF F3—
Warren-Detroit, Warren Motor Car Company, Detroit, Mich.

SF A5—
Westcott, Westcott Motor Car Company, Richmond, Ind.

MF, Main Floor. SF, Second Floor.

ACCESSORIES CLASSIFIED.

Ball Bearings.

E12—
R. I. V. Company, New York, N. Y. R. I. V. ball bearings.

B8—
S. K. F. Ball Bearings Company, New York, N. Y. S. K. F. ball bearings.

Carburetors.

M3—
Breeze Carburetor Company, Newark, N. J. Breeze carburetors.

M5—
Stromberg Motor Devices Company, Chicago, Ill. Stromberg carburetors.

J3—
Wheeler & Schebler, Indianapolis, Ind. Schebler carburetors.

Demountable Rims.

A3—
Booth Demountable Rim Company, Cleveland, O. Booth Demountable rims.

M4—
Dorian Demountable Rim Company, New York, N. Y. Dorian demountable rims.

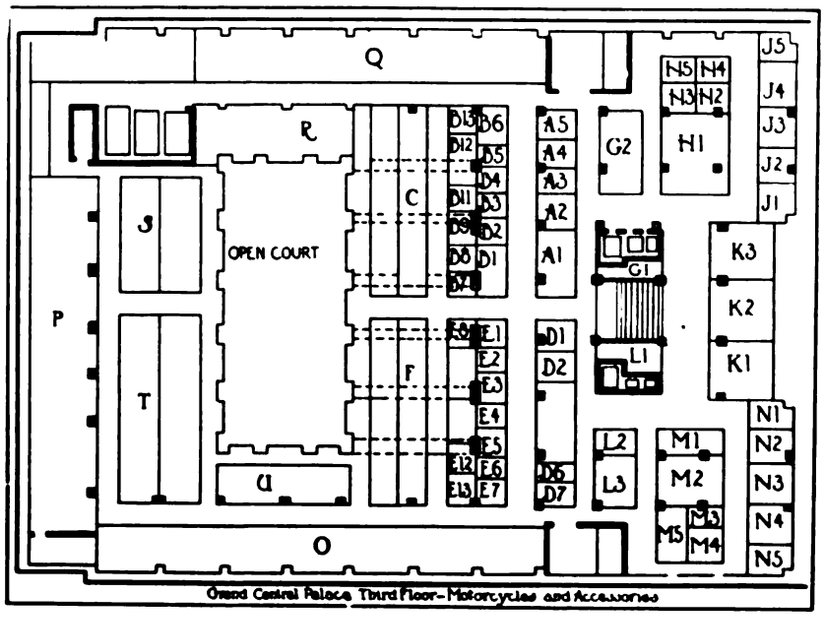
Fittings.

A2—
Dean Electric Company, Elyria, O. Electric horns.

D2—
General Electric Company, Schenectady, N. Y. Magnetos, electrical specialties.

L2—
Gray & Davis, Amesbury, Mass. Lamps, lighting systems.

M5—
Hartford Suspension Company, Jersey City, N. J. Shock absorbers, auto jacks.



Grand Central Palace, Third Floor-Motorcycles and Accessories

B1—
Lavigne Manufacturing Company, Detroit, Mich. Tank gauges, lubricators, vaporizers.

N3—
Remy Electric Company, Anderson, Ind. Magnetos, electrical specialties.

Gasoline Storage.

K2—
S. F. Bowser & Co., Inc., Fort Wayne, Ind. Gasoline storage systems, tanks, etc.

B6—
Wayne Oil Tank & Pump Company, Fort Wayne, Ind. Gasoline storage systems, tanks, etc.

Parts and Components.

N4—
Gemmer Manufacturing Company, Detroit, Mich. Steering gears, etc.

J5—
McCue Company, Buffalo, N. Y. McCue rear axles.

H3—
Muncie Gear Works, Muncie, Ind. Transmissions, steering gears, etc.

B12—
Peck Wheel Company, Chicago, Ill. Wheels.

H2—
Ross Gear & Tool Company, Lafayette, Ind. Transmissions, steering gears, etc.

D6—
Timken-Detroit Axle Company, Detroit, Mich. Timken-Detroit rear axles.

A1—
United Rim Company, Akron, O. Wheel rims.

Publications.

ES—
Automobile Journal Publishing Company, Pawtucket, R. I.

E7—
Chilton Company, Philadelphia,

E2—
Class Journal Publishing Company, New York, N. Y.

E5—
Class Journal Publishing Company, New York, N. Y.

B13—
Horseless Age Company, New York, N. Y.

B7—
Motor Vehicle Publishing Company, New York, N. Y.

B4—
New Publication Company, New York, N. Y.

B2—
Power Wagon Publishing Company, Chicago, Ill.

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Speedometers.

A4—
Standard Thermometer Company, Boston, Mass. Standard speedometers.

M1—
Veeder Manufacturing Company, Hartford, Conn. Veeder recording instruments.

J1—
Warner Instrument Company, Beloit, Wis. Warner auto-meters.

Storage Batteries.

H4—
Edison Storage Battery Company, West Orange, N. J. Edison storage batteries.

N1—
National Carbon Company, Cleveland, O. Columbia dry cells.

Tires, Tubes and Rims.

K1—
Diamond Rubber Company, Akron, O. Diamond tires and tubes.

J4—
Empire Tire Company, Trenton, N. J. Empire tires and tubes.

L3—
Firestone Tire & Rubber Company, Akron, O. Firestone tires, tubes and rims.

M2—
Fisk Rubber Company, Chicopee Falls, Mass. Fisk tires, tubes, etc.

K3—
B. F. Goodrich Company, Akron, O. Goodrich tires and tubes.

G2—
Goodyear Tire & Rubber Company, Akron, O. Goodyear tires, tubes and rims.

A5—
Motz Clincher Tire & Rubber Company, Akron, O. Motz tires and rims.

N2—
Pennsylvania Rubber Company, Jeannette, Penn. Pennsylvania tires and tubes.

J2—
Swinehart Tire & Rubber Company, Akron, O. Swinehart tires and tubes.

H1—
United States Tire Company, New York, N. Y. Hartford, G & J, Morgan & Wright and Continental tires and tubes.

Miscellaneous.

E1—
Automatic Motor & Engineering Company, Chicago, Ill.

E4—
Calman Asbestos & Rubber Works of America, New York, N. Y. Motobestos brake lining, packing, etc.

H5—
Adam Cook's Sons, New York, N. Y. Albany greases.

D1—
Wm. Cramp & Sons Ship & Engine Building Company, Philadelphia, Penn. Bearing metals, metals, etc.

B3—
Grip Nut Company, Chicago, Ill.

C1—
Chas. E. Miller, New York, N. Y. Accessories, supplies, parts, etc.

B5
Modern Auto Appliance Company, Chatham, N. Y. "Little Steersman."

E13—
National Pump Company, Dayton, O.

D7—
Oliver Manufacturing Company, Chicago, Ill. Jacks.

EXHIBITORS AT BUFFALO'S FIRST DISPLAY.

THE dealers in Buffalo, N. Y., are to have two shows this year, one of which opened in the 74th Regiment armory, Dec. 30, and will continue until Jan. 6. The second, which was thought to be necessary, because this building, though even larger than ever before, was unable to accomodate all who desired to make display, will be held Feb. 5-12. The exhibitors at the first show follow:

Commercial vehicles—Henry Brunn Automobile Co., Peerless; Empire State General Vehicle Company, General Vehicle; George Ostendorf, Franklin; A. W. Meyer Motor Car Company, Knox and Reo; United Motor Buffalo Company, Sampson; Mason B. Hatch, Stearns; Pierce-Arrow Motor Car Company, Pierce-Arrow; Dixon Motor Car Company, Velie; Sanderson & Burghardt Company, Speedwell; Co-Operative Motor Car Company, Pope-Hartford and Mack; Buick Motor Company, Buick; Lutz Automobile Company, White; Louis Engel, Jr., Cartercar; Densmore Company, Packard; Studebaker Corporation, Studebaker; Werick Bros. Motor Car Company, McIntyre and Schacht; Barret Motor Car Company, Kelly; Overland-Buffalo Company, Overland and Garford; Buffalo Kissel Kar Company, Kissel Kar; Anderson Electric Car Company, Detroit electric; Hays-Schoeplin Company, Rapid and Reliance; Lippard-Stewart Motor Car Company, Lippard-Stewart.

Pleasure cars—J. I. Case Threshing Machine Company, Case; Henry Brunn Automobile Co., Peerless; John J. Gibson Company, Mitchell; George Ostendorf, Franklin; Ralph E. Brown Motor Car Company, American, Babcock and Winton; A. W. Meyer Motor Car Company, Knox, Reo and Pullman; United Motor Buffalo Company, Columbia, Maxwell; J. A. Cramer, Stoddard-Dayton; Mason B. Hatch, Chalmers, Hupmobile and Stearns; Pierce-Arrow Motor Car Company, Pierce-Arrow; E. R. Thomas Motor Car Company, Thomas; Dixon Motor Car Company, Herreshoff and Velie; Sanderson & Burghardt Company, Firestone-Columbus, Havers and Speedwell; Co-Operative Motor Car Company, Abbott-Detroit, Pope-Hartford and Stevens-Duryea: Poppenberg Motor Car Company, Paige-Detroit, Warren and Everitt; Albert Poppenberg, Apperson, Clark and Westcott; Buick Motor Company, Buick; Lutz Automobile Company, White and Premier; Louis Engel, Jr., Cartercar; Babcock Electric Company, Babcock; Matheson Automobile Sales Company, De Tamble and Union; K-R-I-T Motor Car Company, K-R-I-T; Windsor Motor Car Company, Elmore and Kline-Kar; Densmore Company, Packard; Centaur Motor Company, Oakland; Studebaker Corporation, E-M-F and Flanders; Frontier Motor Car Company, McFarlan; Werick Bros. Motor Car Company, Haynes, McIntyre and Schacht; Zimmer Motor Vehicle Company, National; Fiat Sales Company, Fiat; Edgar Messersmith, Lexington and Whiting; Barret Motor Car Company, Hudson; Baker Bros. Motor Car Company, Cole and Nyberg; Olds Motor Works, Oldsmobile; Delaware Ave. Garage, Marmon; Hupp Corporation, R. C. H. and Hupp-Yeats; F. A. Ballou, Brush, Jackson and Selden; Overland-Buffalo Company, Overland and Garford; Buffalo Kissel Kar Company, Kissel Kar and Simplex.

Accessories—Standard Oil Company, Polarine oils; Brunn & Co., tops and bodies; Polson Manufacturing Company, windshields; Jaynes Automobile Supply Company, general line; Frey Automobile Supply Company, De Luxe overhead washers; Iroquois Rubber Company, G & J tires; Frontier Rubber Company, Frontier tires; Chas. E. Miller, full line; Niagara Lead & Battery Company, Salom batteries.

DENVER SHOW EXHIBITORS.

While the Denver automobile show is still some distance away, being scheduled for March 4-10, not a little interest has been awakened in the commercial vehicles which will be displayed. Practically every agency in the city will be represented, and it is anticipated that a number from other sections of the Southwest will secure space if possible. Among those who will show business vehicles are the following:

W. W. Barnett, Alco; Overland Automobile Company, Brush, Kissel-Kar, Overland, Seitz; MacFarland Automobile Company, Buick, Packard; Timpte Bros. Wagon Company, Chase; Continental Motor Truck Company, Continental; Havens Bros. Motor Company, Dorris, Kelly; Colorado Motor Sales Company, Grabowsky; Mathewson Automobile Company, Reo; Fernald Automobile Company, Sampson; Mead Autocycle Company, White; Krebs-Gotshall Automobile Company, Detroit electric; Carstarphen Electric Company, General Vehicle electric; Felker Automobile Company, Waverley electric.

WILL SELL PEERLESS TRUCKS.

R. S. de Mitkiewicz, formerly sales engineer with the Motor Engineering & Sales Company of New York City, has resigned to accept a position with the truck department of the Peerless Motor Company of New York, at 1760 Broadway and 57th street. His headquarters will be at that address, but he will occupy his time in placing Peerless trucks, made by the Peerless Motor Car Company, Cleveland, O., in the East.

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TREND OF DESIGN IN COMMERCIAL CARS.

Rapid Progress Noted in Development of Practical Power Wagon---Simplicity and Accessibility Features of New Models Ranging from Light Delivery to Heavy Truck.

BELIEVING that there is a demand for a commercial vehicle of 1000 to 1500 pounds carrying capacity, the Sullivan Motor Car Company, Rochester, N. Y., is manufacturing and marketing a chassis to which is fitted several types of bodies, these being designed principally for delivery work. The same chassis is utilized for all models, its sturdy construction permitting of this arrangement, and being well powered is capable of taking care of reasonable overload.

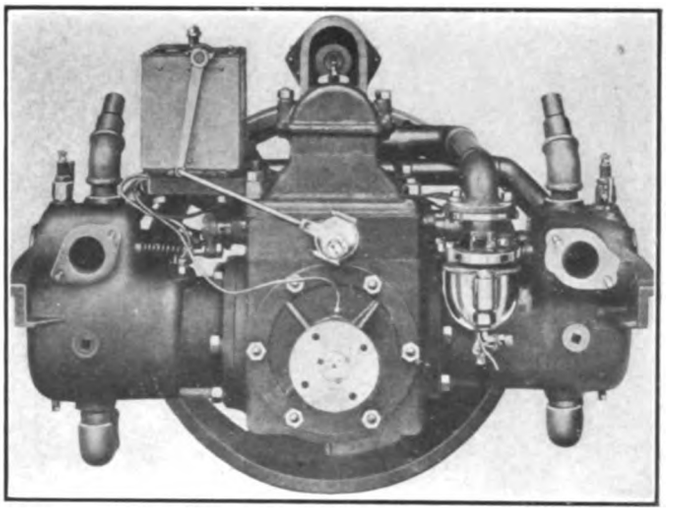
The motor is located in front and the arrangement of the power plant is very compact as well as easily accessible, being reached by the lifting of the usual bonnet. It is a two-cylinder, four-cycle, water-cooled unit, with a 4.5-inch bore and stroke and rated at 18 horsepower, being of the horizontal double-opposed type, and the cylinders are cast singly with liberal water jackets, these being cast integral therewith. The cylinders are machined and ground carefully, as are the pistons and rings, insuring good compression.

The connecting rod, main and camshaft bearings are of ample dimensions, these being reached easily by the removal of the top section of the crankcase on which is fitted the magneto. The crankshaft is 1.75 inches with bearings 3.8125 inches. The connecting rod bearings are 1.75 inches. A Schebler carburetor is fitted, this being located on the right hand side of the motor, well protected from dirt and possible injury, and the intake pipes leading to the cylinders are well designed and free from sharp bends, thus facilitating the passage of the mixture.

The five-feed mechanically operated oiler is carried on an extension of the upper crankcase on the left hand side of the motor and is positive in its action. Cooling is by the thermo-syphon system, the water pipes being of liberal size. The radiator is located in front and cooling is aided by blades in the flywheel of the engine. Ignition is by a Bosch high-tension magneto.

An improved planetary transmission is fitted and energy is transmitted to the driving shaft by another shaft carrying a dust and oil-tight universal joint. Brown-Lipe gears are utilized in the differential, and Hyatt roller bearings and ball thrusts in driving shaft. Final drive is by side chain and the sprockets are adjustable and detachable. Internal expanding, 10 by 2.5-inch brakes, are fitted to the rear wheels and are positive in action, this being brought about by an equalizer. These members are easily reached and adjusted.

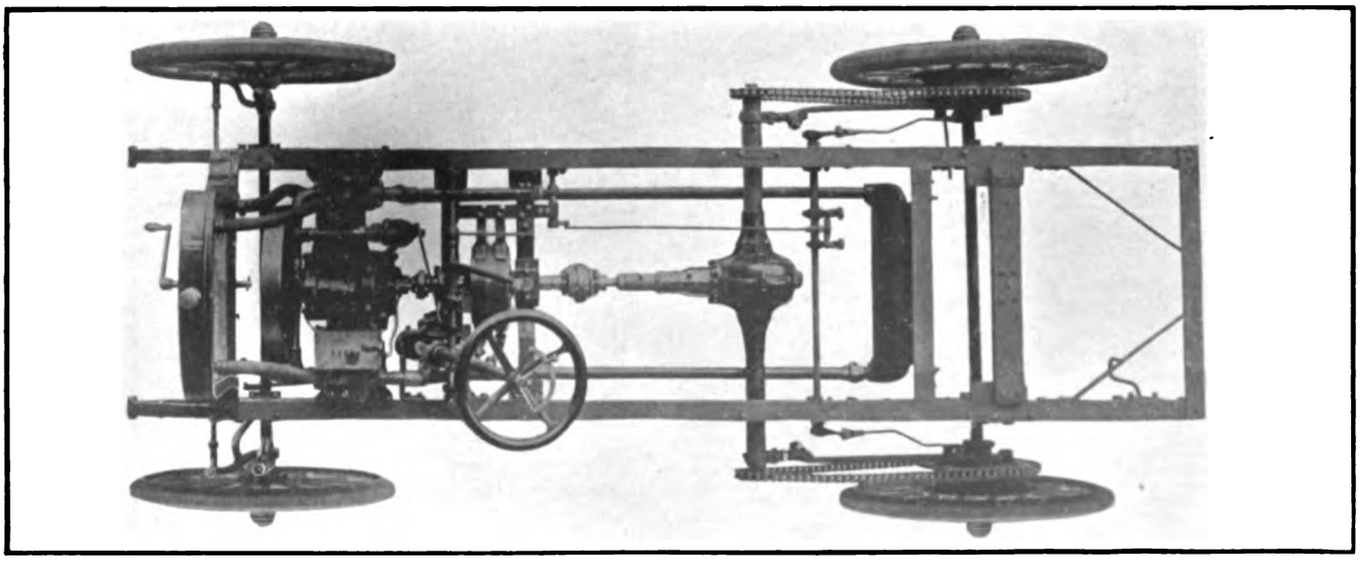
The frame is of liberal dimensions and all sections including cross members are hot riveted. Steering is by the



Power Plant, Showing Compact Arrangement of Components.

usual wheel and the control of gas is by lever mounted thereon. The driver's position is at the left with centre control. The front axle is 1.375 inches and rear 1.75. Full elliptic springs are employed both front and rear, those of the former being half-scroll and the latter full. Solid tires are fitted, 36 by 2.5 inches.

The design of the frame is such that a long overhang body may be fitted as will be noted in the accompanying illustration. This section of the frame is strongly reinforced by two large cross members. This arrangement permits of the fitting of a body of the express type and that made by the company is 72 inches long and 42 inches wide. A full wood panel body is also fitted to the same chassis and is made of ash frame work and heavy sills with bevel plate glass doors in rear and windows in side. This type of body is unusually neat and attractive in appearance, is highly finished and especially adapted to delivery work.

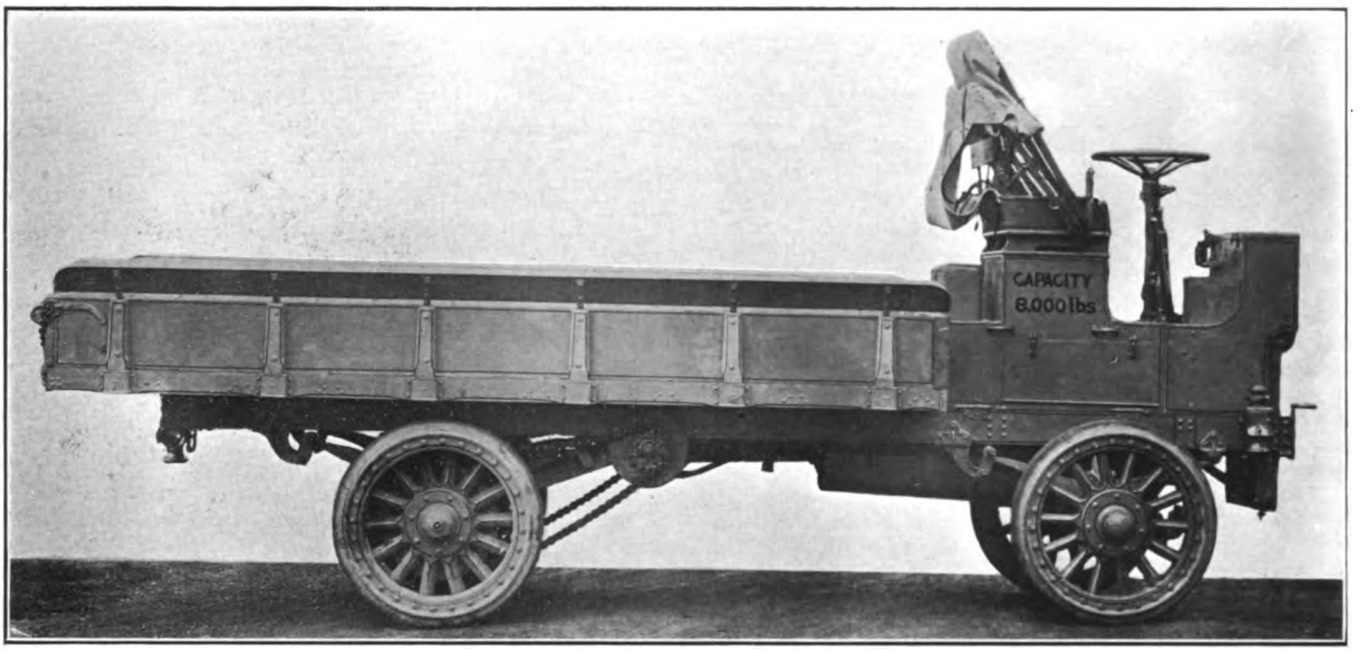


Chassis of Sullivan Car Which Is Fitted with Horizontal Double Opposed Motor Located in Front and Easily Accessible.

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SPEEDWELL PRODUCT INCLUDES LARGER TRUCKS.

SPEEDWELL commercial vehicles, manufactured by the Speedwell Motor Car Company, Dayton, O., maker of the well known pleasure cars of that name, include in addition to ambulances, patrols and other automobiles designed for municipal service, two machines of four and six tons capacity, respectively. These are said to include features not found on any other make of power wagon, although in the main they follow standard lines of construction. The four-ton truck, which is illustrated herewith, is built in two lengths of wheelbase, 115 and 139 inches, and although a wide variety of bodies is fitted, special types may be procured from the company.



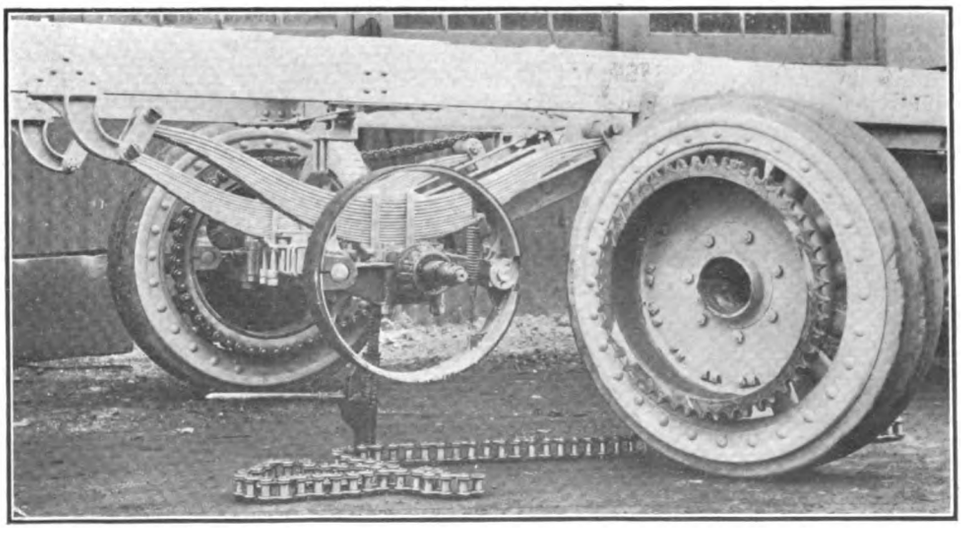
Four-Ton Speedwell Fitted with Standard Sideboard Body, Including Folding Top, Storm Front and Curtains.

The motor is located in front, under the floorboards of the driver's seat, and is easily accessible for minor adjustments by removable panels. The framework of the seat is hinged and by removing bolts may be raised at either side, a commendable arrangement, and one that uncovers the entire driving mechanism.

The chassis has a four-cylinder, four-cycle, water-cooled motor with a five-inch bore and stroke and is rated by the maker at 40 horsepower at 1000 revolutions a minute, which represents the maximum at which the vehicle should be run, 12 miles an hour. The cylinders are cast in pairs with integral water jackets, and are of the L type.

A Schebler, water jacketed carburetor is incorporated, the feed being gravity from a 19-gallon tank over the radiator. Ignition is by a high-tension Eisemann magneto with automatic spark advance. As the motor will start by cranking with this member, no battery system is fitted. Lubrication is by the splash system, a gear driven pump forcing the oil through a sight feed on dash to the crankcase where a constant level is maintained. A cellular radiator, suspended on double coil springs, is provided and the water is circulated by a centrifugal pump and cooling assisted by a belt driven fan.

The clutch is cone, leather faced. A selective type of transmission, affording three speeds forward and a reverse, is controlled by a single lever located in the centre of the footboard and at the right of the operator. Drive is by shaft to jackshaft, in which the differential is housed, and by sprockets and side chains of ample dimensions to the rear wheels. A differential device is fitted for the purpose of securing traction by both wheels, this being brought about by locking. This is operated by a lever which extends through the sides of the main frame.



Showing Construction of Rear Wheel Brakes, Springs, and Auxiliary Spring Member.

Semi-elliptic springs are fitted both front and rear, the former being 40 by three inches, and the latter 48 by three. An auxiliary member is hung from a cross member on the frame and bearing upon plates mounted on the rear axle comes into operation only when the truck is loaded nearly to its full capacity. The front axle is of the solid I beam section type, ample in size as is the rear member. The front and rear wheels are mounted with Timken roller bearings and both these members are 36 inches fitted with five-inch solid tires, single in front and dual at the rear. Two sets of brakes are provided.

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SAURER TRUCK PRESENTS STURDY CONSTRUCTION.

SAURER trucks, the chassis of the 4.5 and 6.5-ton sizes of which are shown herewith, are manufactured under license in this country by the Saurer Motor Company, Plainfield, N. J., a constituent of the International Motor Company, New York City. The Swiss product enjoys an enviable reputation, having won 53 first prizes in European contests, and the recently completed Ocean-to-Ocean trip of 5200 miles in America, which was finished without a mechanical or structural defect being brought out, gives some idea of the car's reliability.

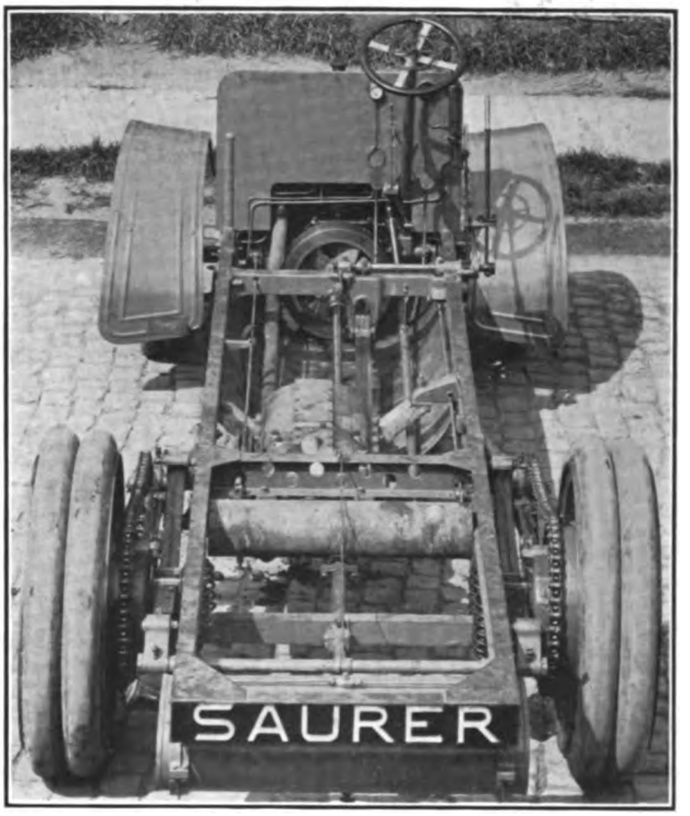
Three special, patented mechanical features, each desirable, mark this design. They are: The Economy carburetor, the air brake and the self-starter. The first named has two nozzles, the operation of which is controlled by an automatic clock valve. One jet is constantly in use, the second being brought into play when the speed of the motor reaches a certain point. The self-starter is on the compressed air principle.

The motors fitted to the 4.5 and 6.5-ton trucks are four-cylinder, four-cycle, water-cooled, with cylinders cast in pairs. The valves are on the opposite sides, of nickel steel and of liberal dimensions. The motor is rated at 37 horsepower at 1000 revolutions, having a 4.375-inch bore and 5.75-inch stroke. Crank, cam and fanshafts are mounted on imported ball bearings, of large diameter, and all are of the finest chrome-nickel steel. In machining and assembling, special care has been given to the matter of correct balance, both running and static, this resulting in a quiet, powerful motor.

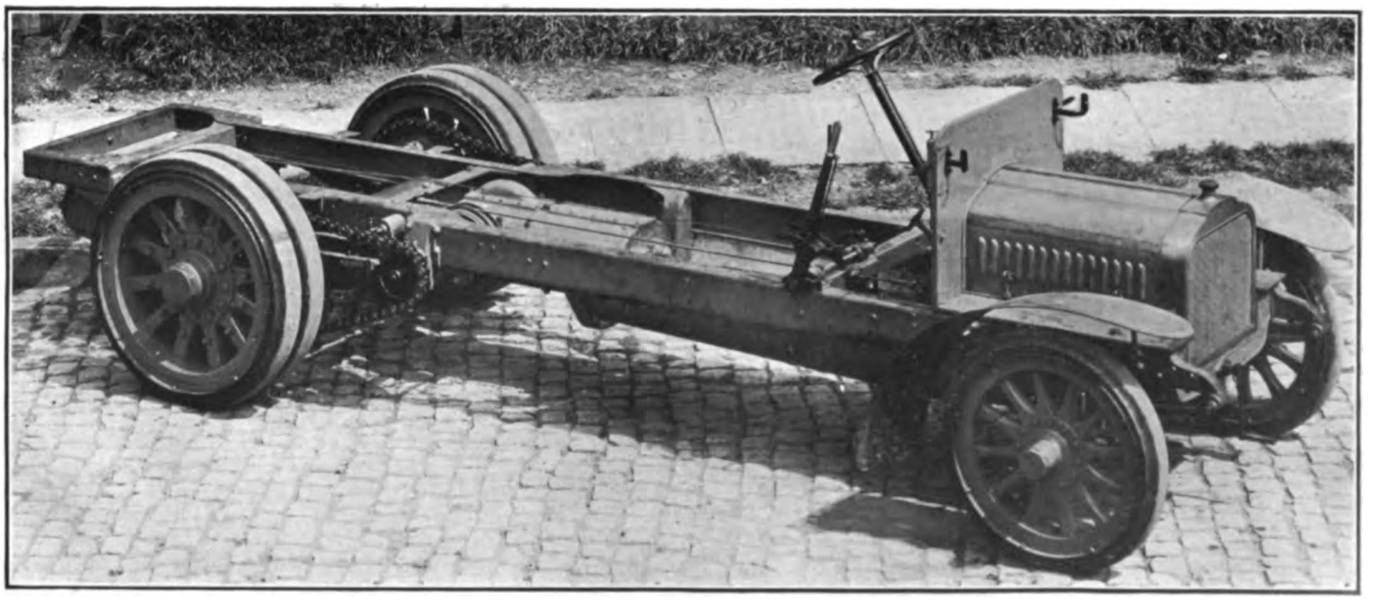
Lubrication is of the forced feed type with gear inside the oil tank and driven from the governor shaft by spiral gears. Cooling is by water, actuated by a centrifugal pump, easily accessible. Ignition is a high-tension magneto with spark advance lever on the dash, and is advanced or retarded by means of a sleeve on the driving shaft. The motor is controlled through a governor of the centrifugal ball type, this being restricted by a spiral spring. A cone clutch is used, leather faced with a rubber ring below it. The spring pressure is such as to give easy engagement and release. A four-speed transmission is utilized, the gears of which are of nickel steel and the shafts are mounted on annular ball bearings, with thrusts for lateral stresses. The differential gear, of the four-pinion bevel type, is mounted in the gearcase. The jackshaft is of chrome-nickel steel mounted on ball and thrust bearings.

Three sets of brakes are provided; the air form, which the driver operates by a short lever on the dash; the usual contracting band on the differential shaft operated by pedal, and the internal expanding in the rear wheels. The axles are of special drop forged steel, of large section.

The wheels, which run on roller bearings, are ample in size, and are fitted with solid tires, single in front and dual in the rear. Those of the 4.5-ton are equipped with 36 by five inches front and 42 by five inches rear. The rear wheels of larger chassis have 5.5-inch tires. The weight of the smaller chassis is 5700 pounds while that of the larger model is 6900. The wheelbases are 153 and 159 inches.



Chassis of 4.5-Ton Saurer Truck, Illustrating the Sturdy Construction of Frame and Cross Members and Low Centre of Gravity.

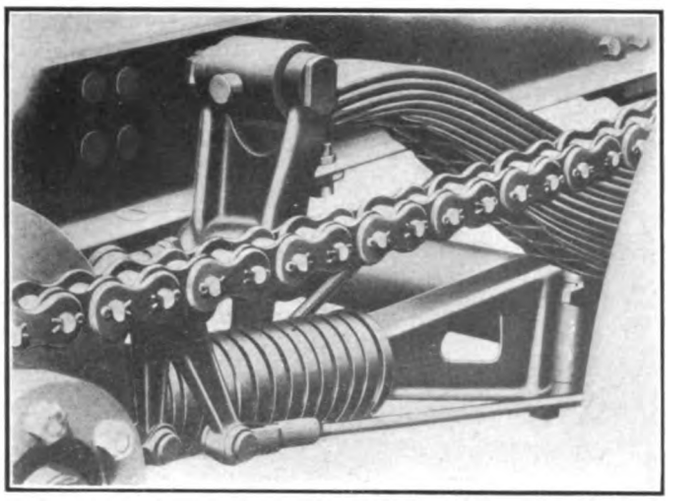


Depicting Special Inside Rear Spring Construction and Straight Line Drive on 6.5-Ton Model.

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VELIE LINE CONSISTS OF THREE MODELS.

VELIE commercial vehicles, made by the Velie Motor Vehicle Company, Moline, Ill., consist of three models, 1500-pound, 1.5 and three-ton, respectively. Every working part is easily accessible, facilitating inspection. The



Showing Velie Spring Strut Rod and Outside Spring Suspension.

design is such that the weight of the load is evenly distributed permitting of lighter spring suspension at the front axle thus protecting the power plant from road shocks and vibration. Among other features are: A heavier frame, larger wheels and tires, spring strut rods, differential lock, large rear axle, and means for driving a loading winch.

The chassis is a complete unit in itself to which may be attached any standard, optional or special body, and is made in two lengths of wheelbase, of 142 or 178 inches in the three-ton size, permitting of carrying receptacles suitable for any requirements. The chassis may be turned in a 50-foot circle. The weight of the longer member is 6000 pounds, and that of the smaller, 5550. The regular stake body, such as shown in the accompanying illustration, weighs 1000 pounds.

The motor, which is located in front, is a four-cylinder, four-cycle, water-cooled type with a 4.5-inch bore and 5.25-inch stroke. The cylinders are cast in pairs with integral water jackets. The water is circulated by a large centrifugal pump on the right hand side of the engine, and the radiator is suspended upon a spring cushioned saddle to absorb road shocks. Cooling is aided by a belt driven adjustable fan. A splash system of lubrication is employed and a constant level in the crankcase is maintained by a pump. A sight feed is fitted to the dash and the reservoir is of six quarts capacity. Ignition is by a Splitdorf magneto which is independent of the auxiliary, consisting of batteries and the Atwater Kent system. The spark and throttle levers are mounted on the steering wheel and provide control up to a rate of 12 miles an hour. An automatic governor prevents a greater speed, this member being sealed in a case to prevent the operator changing its adjustment.

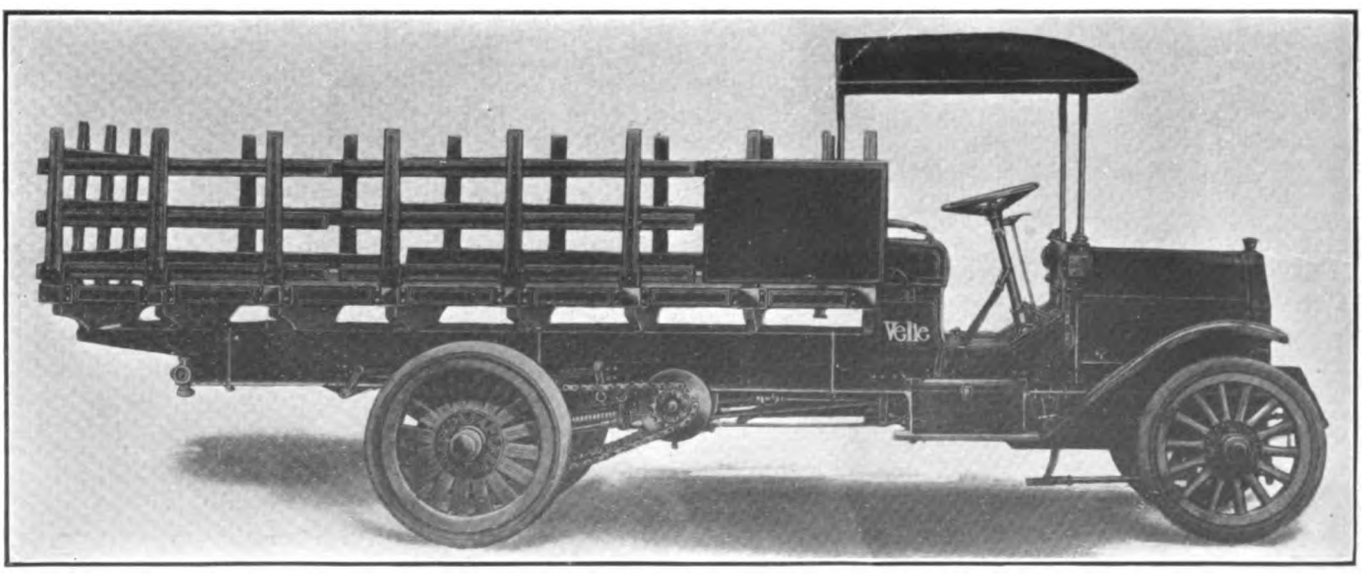
A three-plate disc clutch is utilized and is fitted with an automatic clutch brake. The selective sliding gear transmission, which provides three speeds forward and a reverse, and the extra heavy gears and shafts are made of nickel steel, mounted on Timken bearings and have a 1.5-inch face. The jackshaft and differential also are sturdily constructed and carried in a separate housing from the transmission. The differential gear is 15 inches in diameter and the entire assembly is mounted on Timken bearings. A double Spicer universal joint drive is employed between the transmission and jackshaft, and the latter is supported by a spring torque arm.

Final drive is by 1.75-inch extra heavy roller side chains and the adjustable strut rods are fitted with heavy springs which cushion any shock on the jackshaft, protecting that member as well as gears and chains. Provision is made for the fitting of sprockets to drive a loading winch.

The front springs are semi-elliptic, 40 inches, 2.5 inches wide, while the rear members are of the same type, three inches wide, hung outside the frame to reduce height and lower centre of gravity. Two sets of brakes are fitted, the service being on jackshaft, 14 by 2.5 inches, and operated by pedal. The emergency members are 18 by 3.5 inches on rear wheels and operated by hand lever with notched quadrant for locking.

The steering gear is a special Velie design, of the worm and sector type, and operated by a 20-inch wheel. The fuel capacity is 15 gallons and the water tank carries 12 gallons. A differential lock is fitted, this member being operated by pedal convenient to driver. This device permits of the locking the rear axle so that both wheels may be driven positively, thus overcoming the slipping of one.

The front wheels are 36 inches in diameter fitted with single solid tires. An unusual construction is that of the spokes of the rear members, these being three inches square, 40 inches in diameter and shod with five-inch dual tires. For this arrangement the company claims a tire assembly not found on any other truck of equal rated capacity, and that the larger wheels and tires mean long life and a capacity of withstanding overloading without depreciation.



Velie Three-Ton Truck Fitted with Standard Stake Body, the Design of Which Makes for an Even Distribution of Load.

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LIPPARD-STEWART OFFERS EXCELLENT FEATURES.

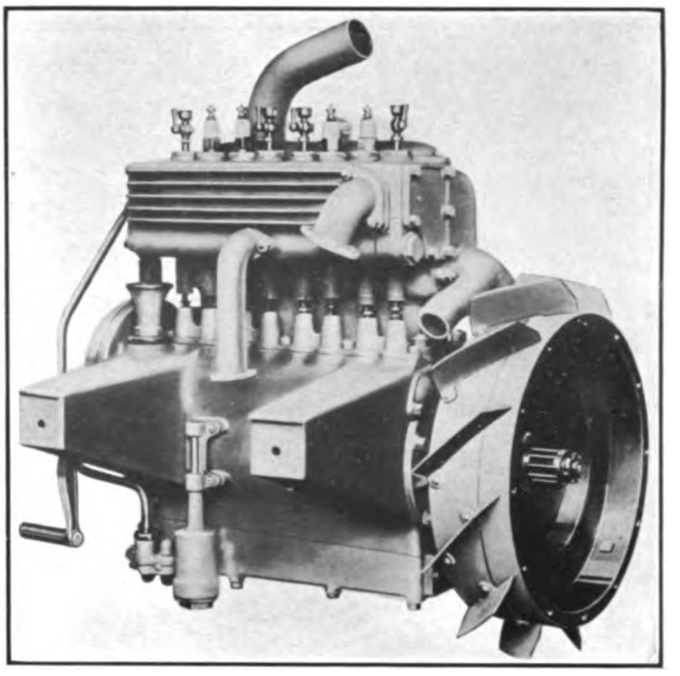
LIPPARD-STEWART delivery cars, manufactured by the Lippard-Stewart Motor Car Company, Buffalo, N. Y., are made in one chassis size, that of 1500 pounds capacity, and to this is fitted many types of bodies to suit the needs of purchasers. The principal styles are seven in number, that illustrated herein being of the open box design which provides a loading space 75 inches long and 45 inches wide.

The chassis embodies many features which are confined to high priced vehicles, and throughout the mechanical details are refined to a high degree. Compactness, simplicity and accessibility are the results of careful designing and construction. Many ideas incorporated in leading foreign commercal vehicles are included, such as fixed spark and location of the radiator. Throughout the best of material and workmanship is in evidence and many units are of unusual strength.

The motor, which is shown in an accompanying illustration, is cast en bloc of special gray iron, and is a four-cylinder, four-cycle, water-cooled unit with a 3.375-inch bore and 4.3125-inch stroke, rated at 20-22 horsepower. The mechanically operated valves are located on the left side and actuated by the camshaft which is supported by large annular bearings. The crankshaft is of special heat treated steel, but 18 inches in length and is of liberal size, 1.875 inches, and has large sized annular ball bearings.

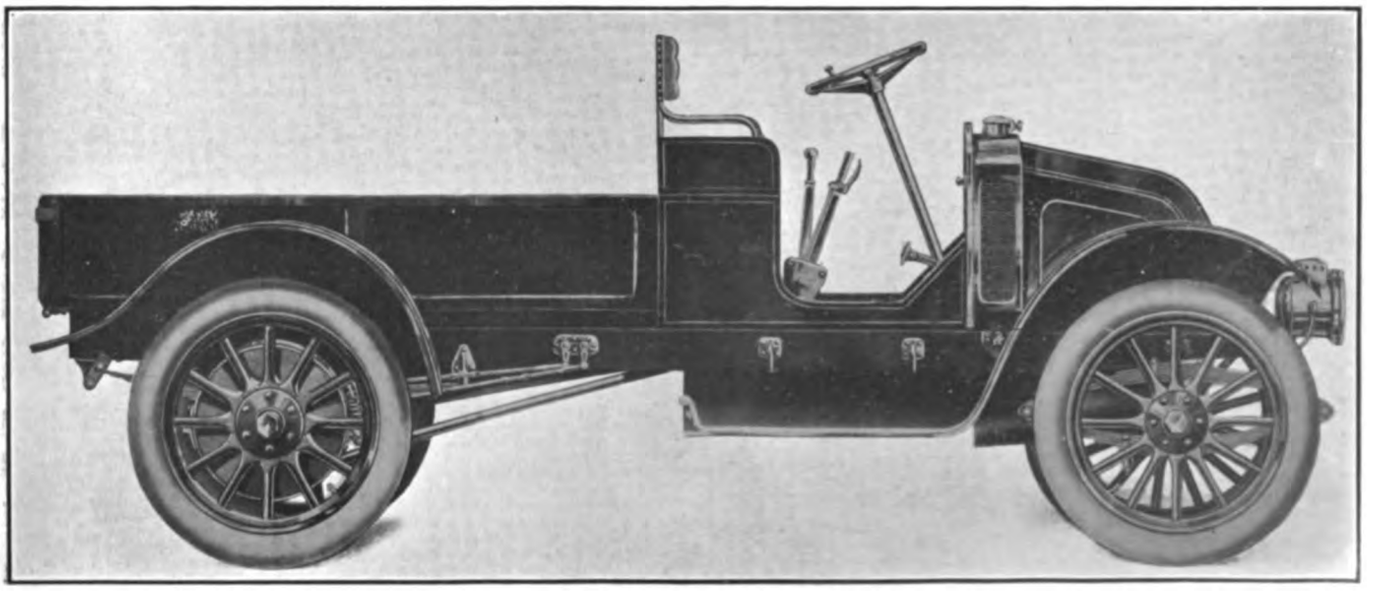
A Kingston automatic carburetor is located on the left hand side of motor, and the arrangement of the intake pipe is such that carburetion is facilitated. The lubrication system is of the constant level splash type, operated by a gear pump which circulates the fluid through the crankcase and tank integral with it, and the capacity is two gallons. Cooling is by the thermo-syphon system, very large water spaces being provided around the cylinder, and the pipes leading from the radiator at the dash are of liberal dimensions, assuring perfect cooling. The usual fan arrangement is dispensed with, a suction member fitted to the periphery of the flywheel serving the purpose. The true high-tension Bosch magneto is employed, this arrangement eliminating the auxiliary ignition system and providing a fixed spark, a practise favored abroad.

The clutch is of the multiple disc type, 12 steel plates against Raybestos being enclosed in a case which is integral with that of the transmission. The latter is of the selective type, providing three speeds forward and a reverse, and the centre control levers are a part of the transmission, eliminating extra parts. The front axle is of the I beam section, with spring seats forged in one piece. The rear axle is a special Timken of the full floating type. Timken roller bearings are used throughout, these being installed in the steering knuckles. The differential is easily accessible by means of a large inspection plate.



The Lippard-Stewart Power Plant, a Compact Design Making for Simplicity—Note the Arrangement of the Fan Blades on the Flywheel.

Liberal brakes of the contracting and expanding type are fitted to the rear wheels, and are 17 inches in diameter by 2.5 inches wide. These are positive in action and easily adjusted. Full elliptic springs are employed in front, long semi-elliptic members at the rear, and an auxiliary coil spring is brought into service when the car is loaded. The frame is of channel section, pressed steel, tapered in front to give a short turning radius, and wide at points subject to stresses. The driver's position is at the left with control member at his right. Pneumatic tires, 34 by four inches, with quick detachable rims are fitted, although a 4.5-inch shoe is employed on some models. The wheelbase is 115 inches and chassis weight, 2200 pounds.

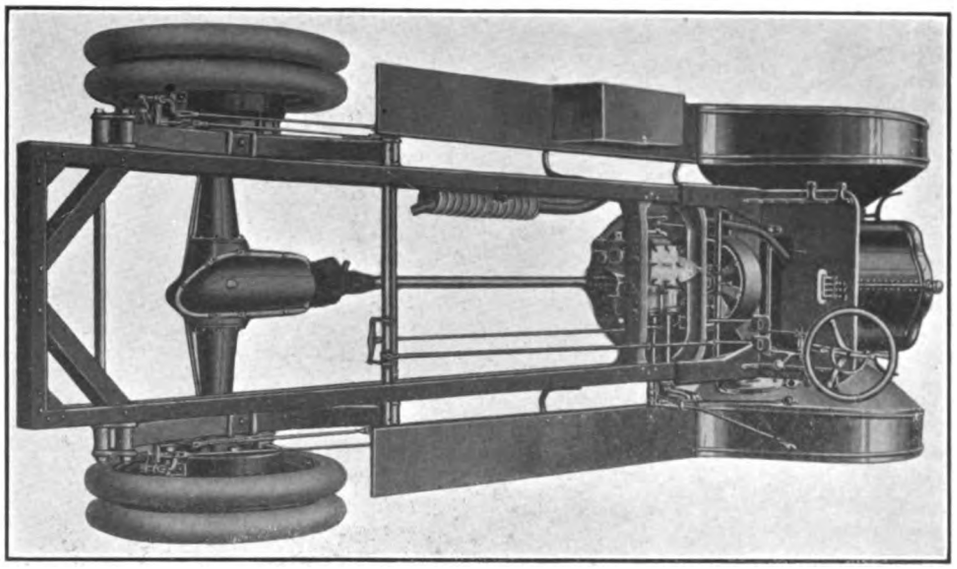


Lippard-Stewart 1500-Pound Capacity Vehicle, the Chassis of Which Contains Mechanical Features Usually Limited to High Priced Cars—Simplicity and Compactness Mark This Design.

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WHITE EMBRACES A VARIETY OF MODELS.

WHITE commercial vehicles, made by the White Company, Cleveland, O., well known maker of pleasure automobiles, are manufactured in sizes ranging from the 1500-pound capacity wagon to the truck designed for carrying heavy loads. The company is a large producer and many of its vehicles are utilized in municipal and government service. Low cost of maintenance, accessibility, and a simple, compact power plant, as well as a high grade of material and workmanship, are the features emphasized.



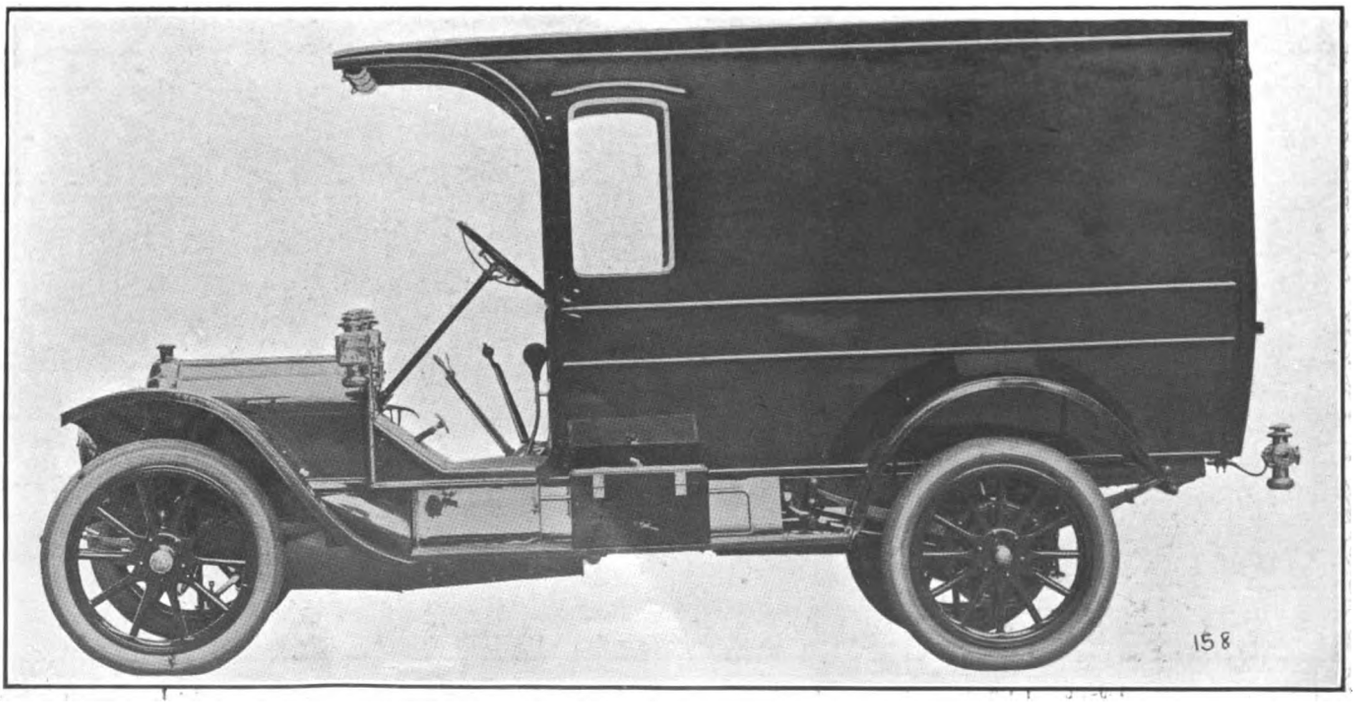
Chassis of the 1.5-Ton White Truck, Illustrating the Compactness of Power Plant.

Lower fuel consumption is claimed of the motor which is located in front, because of its long stroke and heating of the intake and cooling of the exhaust gases. It is a four-cylinder, four-cycle, water-cooled unit with cylinders cast en bloc and the intake, exhaust and water manifolds cast integrally. The bore is 3.75 inches and stroke 5.125. The mechanically operated and interchangeable valves located on the side of the motor, are of liberal size, and enclosed by a removable plate. The water is circulated by a gear driven centrifugal pump, and cooling is aided by fan-shaped spokes of the flywheel. The radiator is supported in such a manner that road shocks are eliminated. The carburetor is a White design, water jacketed, and ignition is by a high-tension magneto. The lubrication system is reliable and efficient, providing as it does oil to all working parts, and the pump is gear driven with a sight feed incorporated on the dash. A device is fitted for relieving the compression when starting the motor, and is operated by a lever on the dash.

A leather faced cone clutch is utilized, and immediately back of this is suspended the transmission which is of the selective type, providing four speeds forward, with direct drive on the third, and a reverse. All gears are of chrome-nickel steel, ball bearing shafts, and the gearcase is supported on cross members of the frame by a three point suspension.

The chasis of the 1.5-ton truck, which is illustrated here, has a shaft drive from the gearcase to the differential, and is fitted with two universal joints, the rear being telescopic. A large plate permits of easy access to the differential.

Semi-elliptic springs are employed both front and rear, the former being 37 inches long and the rear 45 and of vanadium steel. Two sets of brakes are fitted. The wheels have unusually heavy hubs and spokes, and annular ball bearings are employed. Pneumatic tires are utilized, 36 by four inches, single in front and dual at the rear. The wheelbase is 144 inches and tread 56. The fuel capacity is 18 gallons. The total weight is 3710 pounds. Fitted with the standard express body, the length inside back of seat is nine feet two inches, and 52 inches wide. With the standard stake platform type the length inside back of seat is nine feet six inches by 64 inches wide.



White 1500-Pound Capacity Delivery Wagon, to the Chassis of Which Is Fitted a Number of Bodies to Meet Requirements.

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NEW RUTENBER MOTOR DISTINCT IN DESIGN.

DISTINCTIVE features characterize the new type of motor brought out by the Western Motor Company of Marion, Ind., sole manufacturer of the well known Rutenber engine, shown in the accompanying illustration. In designing the unit power plant, which is known as the model X unit, it was necessary to construct a new form of crankcase, one providing for the housing of the flywheel as well as for the attachment of a standard type of transmission. Other features include a new location of the centrifugal water pump and a distinctive design of valve lifting mechanism, the arrangement of which is also depicted.

The motor is similar in every respect to other models produced by this company and is a four-cylinder, four-cycle, water-cooled unit with a 4.125-inch bore and 5.25-inch stroke. The cylinders are of the L head type, cast singly, and of semi-steel. They are machined carefully and ground under heat treatment. The valves are all located on left hand side and are operated through very long guides which are cast separately and pressed into the cylinder.

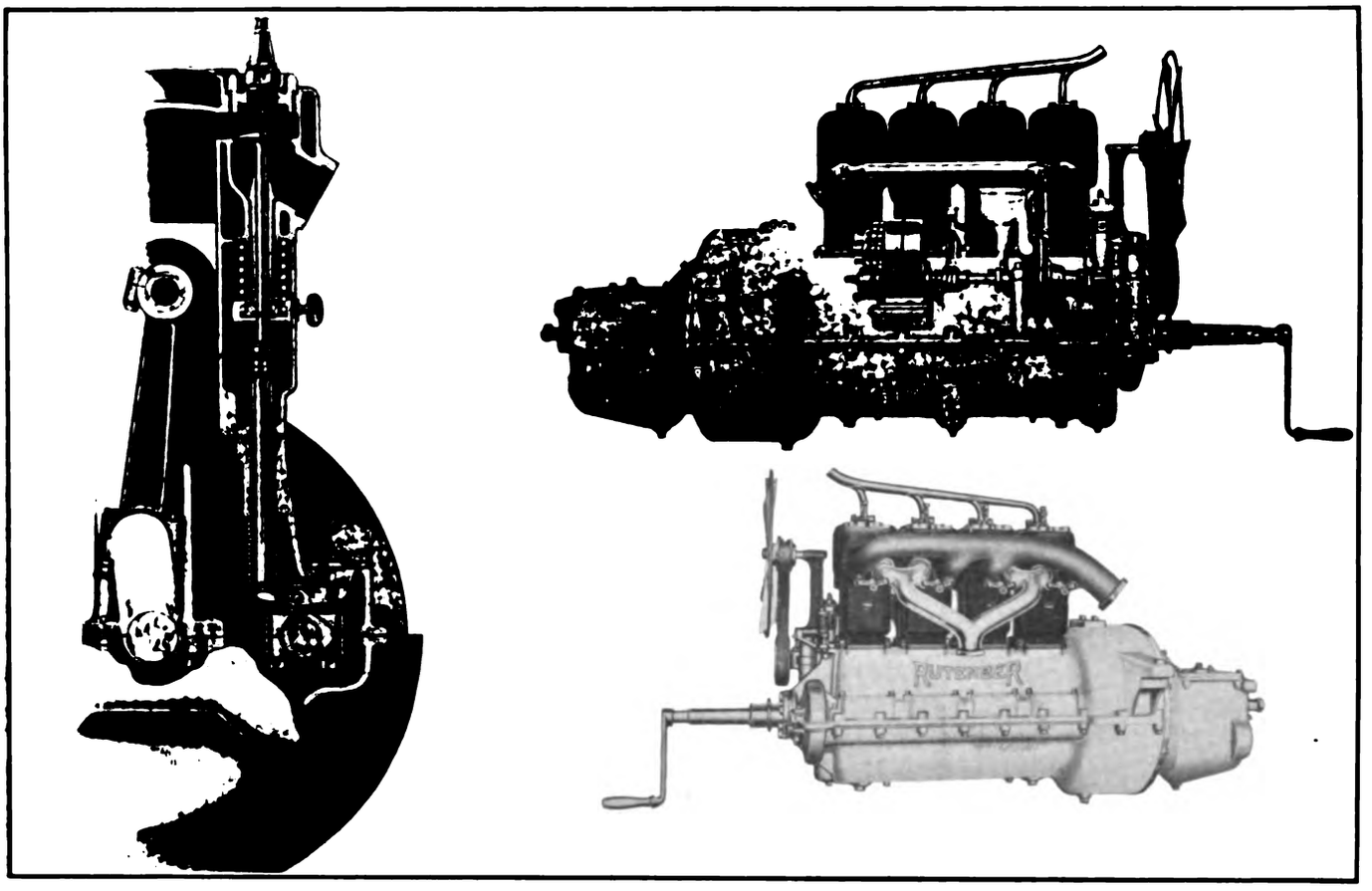
The valve springs are completely enclosed, and have aluminum caps which can be removed readily for inspection or for the adjustment of the valve lifters. Another important feature, a distinctive design, is the valve lifter arrangement which is illustrated in the cross sectional view. This is made up of a forged arm, swivelled from a plate and fitted with a hardened roller and bushing which is in the centre of this lever and directly over the camshaft. The latter is offset to the right, and lowered to the centre of the crankshaft. This design eliminates noise, provides a quicker opening of the valves, enables the motor to develop more power and allows accurate adjustment. The long steel guide is free from side slap and the entire arrangement is claimed to give a more satisfactorily operating motor as the valves seat properly and do not require frequent grinding. This also is said to eliminate carbon troubles.

The exhaust and intake pipes are located on the same side and are of very liberal size and clean castings. Pipes are counterbored in each opening, as also are the cylinders, and a straight nipple is used in this counterbore. Copper asbestos gaskets are fitted between the cylinders and pipes, and the latter drawn up by tiebars on liberal studs, preventing auxiliary air or gas leaks. The water pipes are tapered brass tubing with cast flanges and are attached to the cylinders by liberal studs and acorn head brass nuts.

The oil pump is located at the front and lowest point of the motor, is entirely enclosed, runs in oil, and is driven by a worm gear from the timer shaft, which also drives pump and magneto shafts. Lubricant is supplied to each of the connecting rod compartments by a tube, and small openings allow it to be delivered to each of the connecting rods and bearings. A constant oil level is maintained and the overflow opening is large, preventing an oversupply in the crankcase and possible smoking.

The centrifugal water pump is located on the right hand side of the motor and is driven from the timer shaft, operplace. The oil sight feed is placed on this side, enabling the operator to note at a glance the amount of lubricant in the reservoir. Oil may be supplied at any time by the lifting ating the magneto which is located in a very accessible of a spring cover. The lubricant is strained through a wire mesh before it enters the reservoir which has a capacity of two gallons. The fan is located on a swivel bracket and a spring device is fitted for the purpose of maintaining tension. It is driven from an auxiliary shaft, and is removed easily.

The motor is suspended by three points, arms being cast integral with the upper crankcase at the flywheel housing to support it at the rear, while the third point is at the front; a drop forged flange which is utilized as a support for the starting crank.

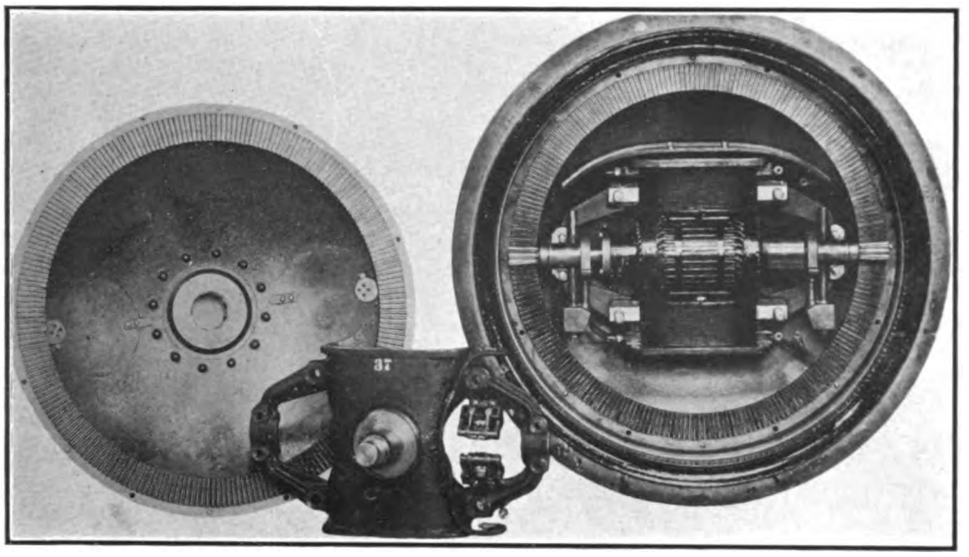


New Type of Unit Power Plant Brought Out by the Western Motor Company, Marion, Ind., Embodying Distinctive Features, Including New Design of Valve Lifter.

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FIVE MODELS CONSTITUTE COUPLE-GEAR LINE.

COUPLE-GEAR trucks, made by the Couple-Gear Freight-Wheel Company, Grand Rapids, Mich., derive their name from the fact that the wheels used contain the driving means, this comprising a gear balanced against a similar member. The vehicles are made in five sizes, the one, 3.5 and five-ton battery driven forms, and the 3.5 and five-ton gasoline-electric types. In the latter, the gas engine drives the generators, which replace the batteries, the wheels being the same, the only change being the method of obtaining the current.



Showing Wheel Disassembled to Illustrate Position of Armature and Method of Fastening Motor in Place, Also Driving and Driven Bevel Gears.

The wheel, which is illustrated herewith disassembled, is of hollow metal and carries the driving electric motor inside. The energy of this is applied to the wheel at two opposite points, with a balanced division of the work accomplished by two driving pinions, one on either side, this being effected by a device called an evener.

These two driving shafts constitute an extension of the motor armature in opposite directions, and carry small bevel pinions, which mesh with very large bevel gears attached to the exterior metal casings of the wheel. One meshes with the inside gear, the other with the outside, the armature shaft being set at a slight angle to allow such action. This gives the same direction of rotation to both parts of the wheel, while the same sized pinions and gears, and like prolongations of the armature result in producing exactly similar speeds.

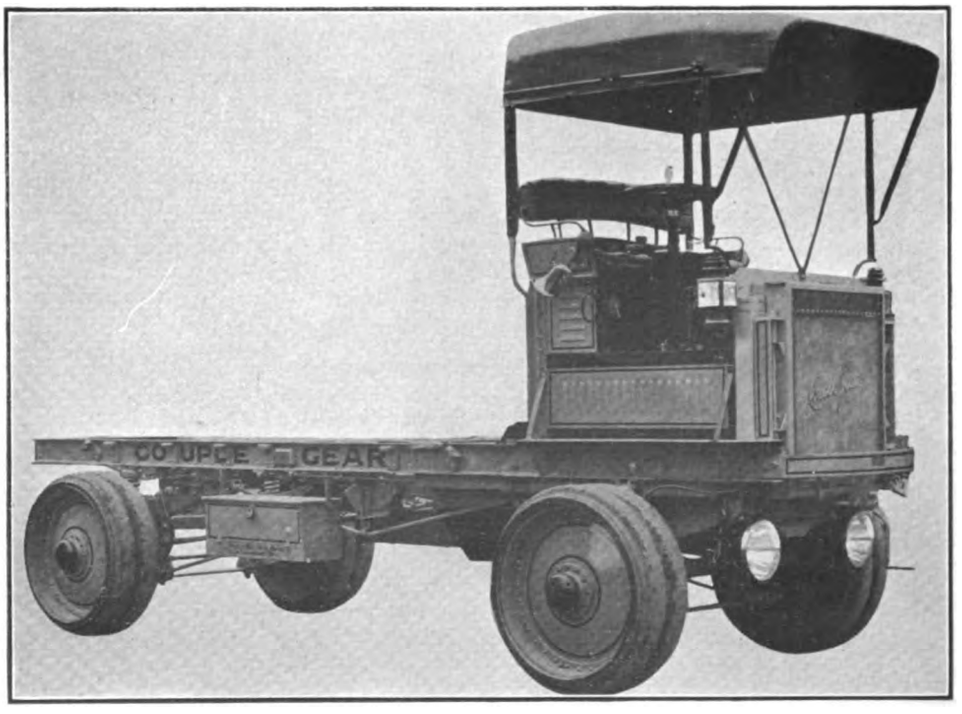
The attachment of the axle stub on which the wheel turns, is made integral with the motor castings within, so that an elongation of the inside stub, keyed to a taper sleeve in the steering knuckle holds the motor in position. This insures that the member shall be held horizontal while the wheel revolves around it.

This same construction allows of the wheel being turned around the knuckle pivot without interfering with the motor action or the transfer of electric current to the motor. It is the same for all wheels, this arrangement providing greater traction.

In the 3.5 and five-ton models of the battery driven type, the batteries are underslung in the middle of the chassis. These are of 44 cells each, the five-ton having 19 W. B. plates against 17 in the smaller car. The controller is of the cylinder type, giving five speeds forward and a like number of reverse. By aid of the patented motor drive, with its 25-to-one reduction, the maker claims a 97 per cent. efficiency. Steering is by means of a vertical post, using a worm and sector gear. Two sets of brakes are fitted, both operating within the wheels.

In the gasoline-electric cars the motor replaces the battery as a source of current. A four-cylinder engine is employed and this with the generator is mounted on a sub-frame. A special generator is utilized and is rated at 12.5 kilowatts at 100 volts, 680 revolutions a minute, and will run without sparking at an ampere load of 200 per cent. in excess of its normal rating. It is of the six-pole type with an equal number of commutating poles, compound wound with dropping characteristics, which automatically assists the engine to hold or increase speed with the rate demanded. The rheostat is connected to the fields and carried on the dash in such a manner that the driver may raise or lower the gear ratio at will. On the 3.5-ton size the wheelbase is 144 inches and tread 66, the tires being 36 by 3.5 dual on all wheels. An electric brake is fitted in addition to two sets of mechanical members.

On the five-ton vehicles illustrated herein, the four motors employed are rated at three horsepower each, giving a total of 12, but all are said to be equal to an overload of 200 per cent. which with the four-wheel traction is said to be equal to the ordinary 50-60 horsepower engine when drive is effected by two wheels only.



Couple-Gear Chassis, Designed to Carry Round Oil Tank 14 Feet Long.

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WAVERLY ELECTRIC VEHICLES WELL DESIGNED.

ELECTRIC commercial vehicles manufactured by the Waverley Company, Indianapolis, Ind., are made in carrying capacities ranging from 600 pounds to three tons. The chassis of the latter size is illustrated here, also a fleet of mail wagons of 2000 pounds capacity, adopted by the United States government. The larger vehicle is fitted with Waverley motors built by the company so that consistent performance can reasonably be expected. The battery equipment is 42 cells, 19 M. V., Hycap, and the mileage on hard, level roads, loaded one-half the distance, is set at 35 miles. The rated speed is nine miles an hour.

A double motor equipment is fitted, this being two series-wound, 80-volt members supported to the sides of the frame in heavy cast steel brackets. These also carry the jackshaft bearings and brakes. Drive from each motor to the countershaft is through a Renold silent chain, and final drive by roller side chains. The primary drive chains are enclosed in metal cases fitted with hand plates that may be removed easily for inspection or other purposes. Radius rods extend from the jackshaft to the rear axle and these are provided with turnbuckles making adjustment a simple matter. Similar members are fitted between the outer ends of the jackshaft and rear axle and this arrangement provides a double alignment under all loads. The motor and jackshaft rotate on annular ball bearings.

The frame is constructed of five-inch channel steel and the members are hot riveted throughout, with heavy gusset plates employed at the ends. The axles are of drop forged alloy steel, the wheel pivots being ground carefully and fitted with Timken roller bearings. The front springs are semi-elliptic, and are anchored at either end to cast steel brackets on the frame and held securely to the axle by steel clips.

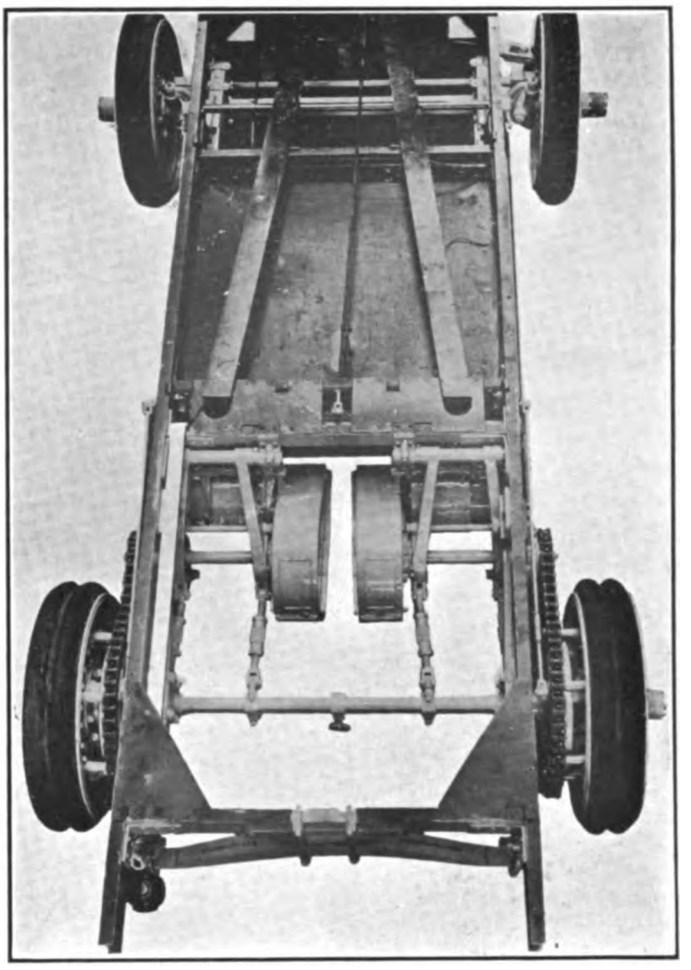
The platform type is utilized at the rear and all springs employed are of a special steel, the members being built up of a number of thin graded leaves. The rear sets are held forward in frame side brackets clip centred to the rear axle and bearing in free action hangers to the ends of the transverse member. The springs are long, providing easy riding qualities.

Two sets of brakes are fitted, one on the rear wheels and the other on the jackshaft, both being operated by pedal. The wheels are of wood, artillery type, 36 inches in diameter, and the front members are equipped with solid five-inch single shoes while the rear have 3.5-inch dual. A sector and pinion form of steering is utilized, positive in action and having few workng parts.

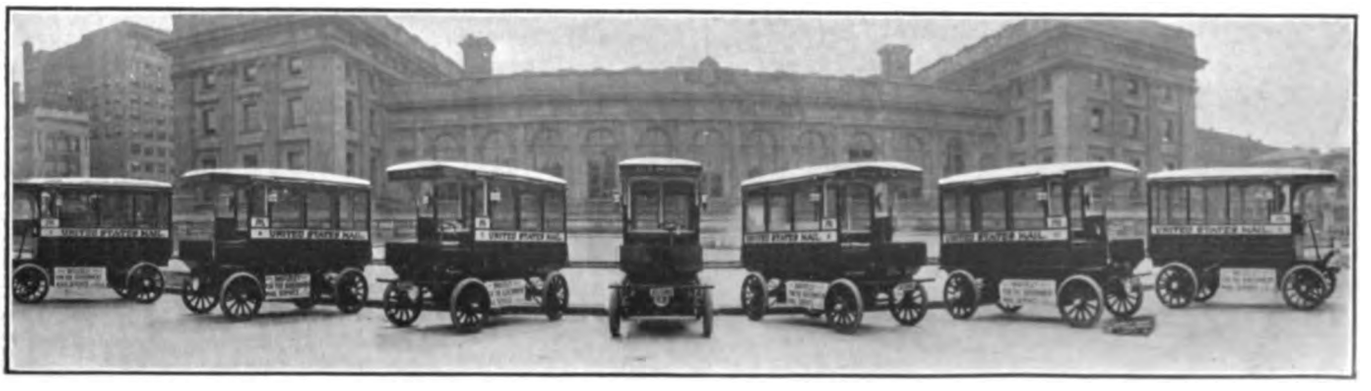
The Waverley controller is of the continuous torque knife blade type, and there is no interruption or break in the current in advancing from one speed to another. It is located under the driver's seat, and operated through a vertical rubber handled lever, which may be locked securely. Four speeds forward and a like number of reverse are obtainable by this type of controller.

The wheelbase is 118 inches and gauge 73 inches. With standard body the width of the clear loading space is four feet six inches, and length back of driver's seat, 13 feet.

The Waverley Company builds a number of commercial vehicles ranging from 600 pounds carrying capacity to the three-ton vehicle described, and a variety of bodies are fitted to meet the requirements of various lines of industry. Quite a number of the 2000 pounds capacity trucks and other sizes have been adopted by the postal authorities and have given excellent service under all conditions. In addition to the business cars the company constructs pleasure vehicles. The Waverley motor is installed in all models.



Chassis of Three-Ton Electric Truck Made by the Waverley Company, Indianapolis, Ind., Showing Location of Motors and Method of Drive.



Fleet of Waverley Electrics Utilized by the United States Government for Transporting the Mail.

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PRESENTS STEAM TRUCK FOR HEAVY WORK.

THE AMERICAN steam truck is produced by the American Steam Truck Company, Lansing, Mich., in the five-ton size, for which is claimed an economy of operation and maintenance not possible with other types of vehicles. This concern and its product are decidedly new in the commercial car field, and a description of the machine will prove of especial interest.

The engine used is designed to develop 50 actual steam horsepower at 300 pounds pressure and 400 revolutions. It is of the twin, quadruple, compound, reciprocating type, assembled in the form of two complete engines in one casing at an angle of 90 degrees, the crankshaft containing a single pin at the apex of the triangle. It may be described as an eight-cylinder machine, four cylinders on either side, each group acting in unison.

The steam enters all four cylinders on either side in such proportions as to exert the same pressure on each of the four pistons, of course at varying steam pressures and at varying dimensions of the cylinders. Regulation is by means of a hollow piston valve, acting in conjunction with properly proportioned ports, in such manner as to prevent expansion in either ports or valves. Steam is cut off at seven-eighths of the stroke, the table selected being as follows:

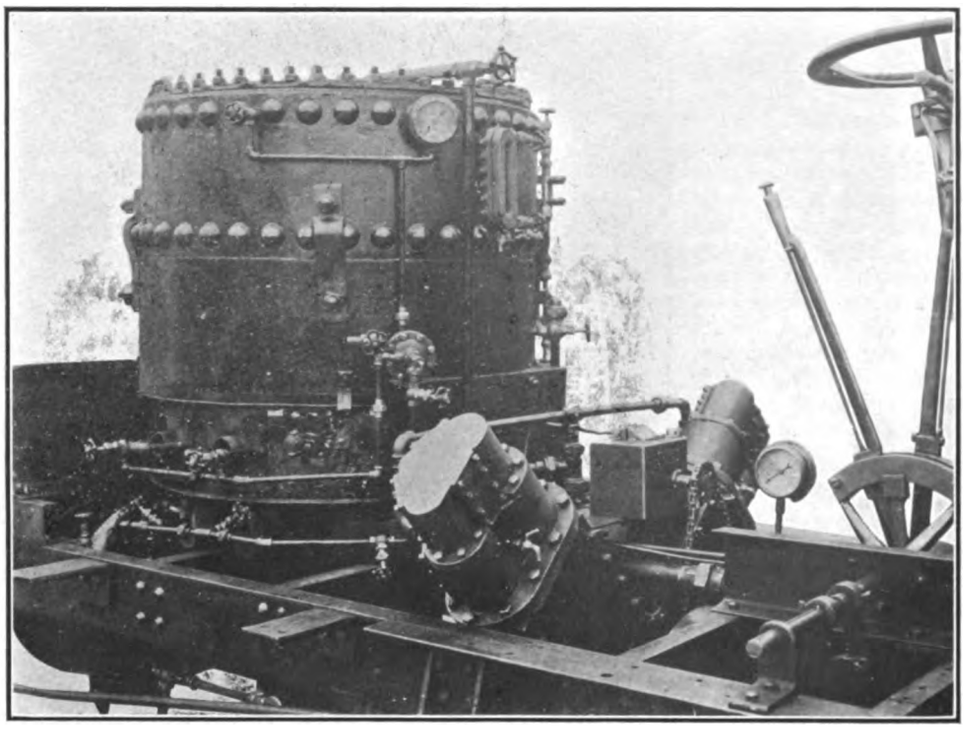
Cylinder	Diameter	Stroke	Area, inches	Pressure, pounds
High pressure	2.5	5	4.90	300
First intermediate	3.5	5	4.37	200
Second intermediate	5.0	5	19.63	133
Low pressure	7.0	5	38.48	89

The engine takes steam through a .5-inch pipe at each end, exhausting in a tube 1.25 inches in diameter. While it is capable of 1000 revolutions a minute, it has a normal speed of from 300 to 600, at a car speed of five to 10 miles an hour. The reversing gear is so arranged as to permit instant reversal of the engine under a full head of steam, this being in itself a positive form of brake.

The generator is known as the semi-flash, drop tube, water level boiler. It consists of two parts, the boiler and the drop tubes, with a shell 24 inches high by 32 inches in diameter. Inside of this shell is the body of the boiler and the furnace. The former is divided into a steam dome above and water reservoir below by the water level line, which is held constant. There are 40 1.5-inch drawn steel fire flues passing through it. The top and bottom plates, or heads, are .6875-inch flanged steel, securely riveted. Two hundred and forty patented seamless circulation tubes are inserted in the bottom plate and extend 10 inches down into the furnace. A water leg completely encircles the boiler, having two brass plugs for cleaning the shell at its bottom. The generator is covered with a steel jacket lined with asbestos for economizing heat. Engine and generator are close together insuring slight condensation in transmission of steam.

By the condensing system employed the steam that would otherwise be exhausted and wasted in the open air is changed to water, which is returned to the boiler in a heated condition and used over and over again, improving the appearance of the truck in operation and economizing on water and fuel.

After entering the engine at about 300 pounds pressure and 450 degrees temperature, the steam is expanded four times in the four cylinders and is then exhausted at low pressure and temperature into a .125-inch pipe, which in turn connects with a 1.5-inch pipe leading to a separator where the oil is extracted from the steam and the pressure of the latter reduced. It then passes from the separator through a .5-inch tube to a feed water heater, where two things are accomplished; the water about to go to the boiler after it has passed the pump, is heated almost to boiling point, and the heat necessary to do this is extracted from the exhaust steam, again reducing pressure and temperature.



Power Plant of American Steam Truck, Including Generator, Engine and Burner.

From the feed water heater, the exhaust passes in pipes through the twin tank and into the bottom of the condenser at the front of the chassis, which it reaches partially condensed. It has travelled nearly 25 feet, is practically devoid of pressure and has a very low temperature. Here, the work of turning the steam into water and also of cooling it is finished before it returns to the water tanks. The condenser has an aluminum top and base connected by thin copper tubes.

In operation, the steam is condensed in the rear half, while the water is cooled in the front portion, by the action of the air which is forced through the tubes by a large fan located directly behind it. To prevent any possible back pressure on the engine, two open pipes lead any unusual accumulation of air or steam to the stack.

The burner used is of the standard type, having two fuel feeds. The fuel is vaporized before entering the combustion chamber and as kerosene is employed it produces a very hot, blue flame, which acting upon the drop tubes of the boiler, generates steam quicker perhaps than any other liquid fuel.

The main flame is shut off at 300 pounds boiler pressure, by an automatic regulator which can be set for any desired pressure, and it is claimed that as the plant generates an over abundance of steam, the burner is not in operation more than two-thirds of the time when the truck is running. It is further claimed that the fuel consumed in furnishing steam for the vehicle will not exceed 15 gallons of kerosene for a day's haul of 10 hours.

Pilot lights burn constantly underneath. With these

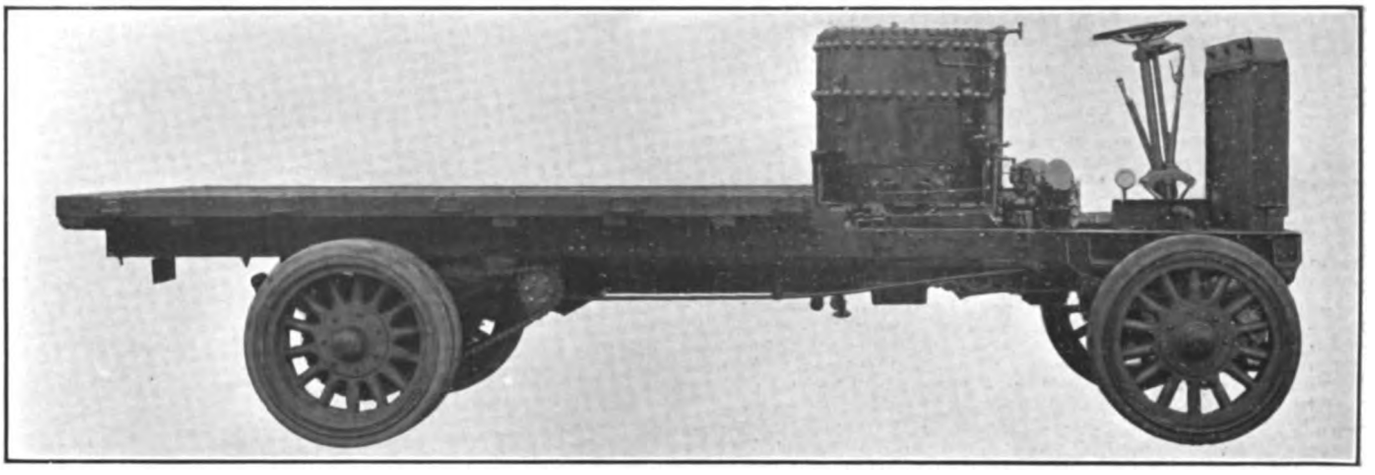
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once fired the burner is always instantly ready to respond and keep the steam up to working pressure. This also may be maintained in cold weather, when the truck is left standing for long periods, by the pilot lights alone.

Owing to the fact that there is constantly 20 gallons of water in the boiler, "firing up" with all parts cold is a longer operation than by the full flash type, but it is claimed that after lighting the pilot lights, the operator will have a working pressure of steam in 20 minutes. When the burner is properly operated it is said to be smokeless.

An automatic regulator is placed on the sides of the generator, which constantly maintains the water at a stated level, as follows: The two pumps furnish water faster and in larger quantities than is necessary to supply the boiler, and force this all of the time the engine is in operation. When the fluid is below its proper level, they pump directly into the boiler through this regulator. When this level is reached the action of the water in the boiler (which is never hotter than 212, no matter how hot the steam may be) closes a valve in the regulator and the course of the water is changed, by passing back into the tanks, but to make assurance doubly sure, a high pressure glass keeps the operator informed as to the exact state of the water line.

Notwithstanding that the water, fuel and steam are all controlled automatically, arrangement is made for the hand control of these elements from the driver's seat. The water glass is stationed immediately behind the seat and



Chassis of American Steam Five-Ton Truck, Showing Complete Assembly of Parts and Their Relation to Each Other.

all gauges on the front of the dashboard. The steering wheel is located on the left hand, and the throttle attachment on the steering post consists of a short lever at the left. Opposite this and fitted to the same collar is a similar lever for reversing the engine. Two long levers operate, respectively, the disengaging clutch and the brake. No transmission is used.

The power plant, engine, generator, burner, etc., are enclosed within the cab. A chain driven air pump, maintaining automatically 60 pounds pressure in the 30-gallon tank, located under the bed and over the rear axles, is used to transfer the fuel from tank to burner. The water supply, 60 gallons for one full day's haul, is contained in two tanks of 30 gallons capacity, each located amidships.

The chassis is constructed of six-inch channel iron bed. All jackshaft and axle bearings are of the Timken roller design. Swinehart tires, 4.5-inch dual rear and five-inch front, are fitted. Any desired form of body can be furnished according to the wishes of the purchaser.

QUIXTART STARTS COLD MOTORS.

A new compound called Quixtart has been placed upon the market recently, and is used as an aid in starting gasoline engines when the cylinders are cold or when the spark is weak. It is said that by its use much time may be saved in cranking as a small quantity of the material poured into the carburetor, auxiliary air valve or intake system at once gives a normal mixture, even in the coldest weather, facilitating the starting of the engine It was first produced by a well known chemist for his own use, but it proved so successful that it was placed upon the market. It is produced by the Quixtart Chemical Company, Providence, R. I.

NEW YORK'S TAXICAB REGULATION.

Alderman Courtlandt Nicoll of New York City has announced his intention of introducing a new ordinance, soon after the organization of the recently elected board in January, reducing the present taxicab rate of 80 cents for the first mile, to 50. Concerning this matter his draft reads as follows: "For the first half-mile or any part thereof 30 cents; for each additional one-third of a mile, 10 cents." The ordinance fixes waiting charges at $1.50 for the first hour or any part thereof exceeding five minutes, and 50 cents for each additional half-hour. For a stop not exceeding five minutes there will be no charge.

Just how this proposition will be received by the taxicab companies is problematical, inasmuch as they claim to be operating on a close margin under the present charges. Still another phase of the situation is offered by the proposed ordinance, in that hotels, railroads, clubs and restaurants will be compelled to accept the service of vehicles, even though such cabs are not owned and operated by the company to which the service privilege has been sold.

Under the present plan the transportation companies pay more than $300,000 annually for these privileges, as evidenced by the following table, prepared by the comsioner of accounts:

Mason-Seaman Transportation Company	$110,513.04
Car & Taxi Cab Company of New York	99,516.43
Connecticut Cab Company	52,187.96
New York Transportation Company	20,232.02
Universal Taximeter Cab Company	20,075.00
Renault Taxi Service	11,496.10
James T. Haverty's Stable	11,252.50
Kayton Taxicab & Garage Company	7,592.72
U. S. Motor Cab Company	6,500.00
Patrick W. Hanrahan	4,800.00
Long Acre Motor Company	2,877.88
Carnegie Hill Livery & Motor Company	1,965.12
New Taxicab & Auto Company	1,606.44
Thomas Comba (approximately)	1,500.00
Joseph H. Penders	1,200.00
Frawley Transportation Company	1,200.00
Cruice, Keelan & Co.	1,100.00
Hart Bros. (approximately)	600.00
B. Van Cott	600.00
Natius Taxicab Company	300.00
Franklin & Ryan	125.00

Not all of these concerns operate motors, and the ordinance is not aimed at such vehicles alone, inasmuch as it reduces the charges for horse drawn cabs as well. It is probable that both classes of service will unite in an effort to prevent its passage.

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The MOTOR TRUCK
Devoted to Motor Driven Business Vehicles of All Classes.

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Entered as second class matter, February 25, 1911, at the Postoffice at Pawtucket, R. I., under the Act of March 3rd, 1879.

CONCERNING THE COMING SHOWS.

Business men who are contemplating the installation of power wagon equipment, will find much of value in a visit to one or more of the so-called national shows. At these it will be possible to study the merits of the productions side by side, with every opportunity to consider the advantages of each with reference to its application in the particular work to which it is proposed to apply it.

While the motor truck may be regarded as having passed the experimental stage, its thorough practicability and dependability having been demonstrated under all sorts of conditions and in every application of service, it undoubtedly is true that the forthcoming displays will bring out a number of refinements in design and details of construction which may be considered as new. It is reasonable to expect that the commercial vehicle will pass through the various stages of development in much the same manner as did the so-called pleasure car, but with this exception, that the industry has been able to learn much from its experience in the older field.

It is somewhat difficult to forecast the features which will be considered important, inasmuch as each business man will be guided largely by his own needs in arriving at a decision on this point. It is perhaps safe to suggest that the effort of the manufacturer will be largely toward economy and reliability, for it must be admitted that he shares with the purchaser in the desire to bring about such results. Every truck sold which presents a satisfactory record in this respect means that it will be that much easier to place others and it is sufficiently well understood that the possibilities for sales are as yet quite unlimited.

TREND OF SELLING METHODS.

Those engaged in the business of selling commercial motor vehicles appreciate thoroughly that absolutely nothing is to be gained by an attempt to discredit the product of other makers. There was a time when this fault was rather too prominent, but it was soon recognized that the good of the industry demanded it be eliminated forthwith. At present, the trend is notably along lines entirely opposite.

The action of at least one motor truck manufacturer in establishing a campaign of education, in which the object is that of interesting merchants and other business men in the advantages to be obtained by the adoption of the mechanical transport, without special reference to any particular make, is a decided innovation. There can be little doubt, however, that the ultimate result will be most satisfactory to the concern which inaugurated the experiment.

Few will be disposed to criticise the statement that the industry needs some such means of calling the attention of the general public to the specific opportunities afforded by its product. That conditions have reached a point where it seems advisable for the manufacturer to devote a share of his investment to this purpose is sufficient indication that the business of producing commercial vehicles is on a stable foundation.

NEED FOR SPECIAL BODIES.

Body design is a matter which is receiving deserved attention on the part of those interested in the future of the industry. There can be little question that the body equipment is quite as important as the chassis, and there is every reason to believe that a field is opened up in its consideration, which offers a splendid opportunity for certain lines closely allied with the horse drawn vehicle, destined to be superseded in a large measure by the motor transport.

Special bodies, in this instance, should be taken to mean those carriers which are to be used in special service. It hardly can be denied that the coal business, for instance, requires a different construction than would apply in the hauling of lumber. Each particular line must be studied with a view of bringing about designs that will apply especially thereto, having in mind the economical operation of the truck. And this will be found to cover a much wider range than is apparent at first thought.

Whether or not the manufacturer shall attempt to solve the problem himself, or call upon the already organized body builder for aid in the matter, must be decided by each in turn. It may be suggested, however, that if the latter course be chosen, the two can work in conjunction without conflict. In fact, it is quite possible that the body builder may be able to offer valuable assistance, because of his long association with this particular branch of his industry.

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THE A B C OF MOTOR TRUCK OPERATION.

A Simple Exposition of the Principles Underlying Operation, Maintenance and Repair of All Motor Driven Commercial Cars, Outlining Details of Components. Part XIV—Necessity for Clutches and Their Forms.

By Morris A. Hall, M. E.

HAVING considered the parts entering into the construction and operation of a motor truck engine, including its form, cycle of operation, means for a supply of fuel, a source of ignition for this, and proper and efficient lubrication, there remains the use of the power developed, its transmission to the road wheels so as to propel the vehicle, and means for controlling its application. An important member in this group is the clutch, interposed between the motor and the change speed mechanism. The operation of this member will be explained in detail, presenting a number of actual examples.

A gasoline or other type of internal combustion engine has a limited output of power for its size and form, this varying widely from one unit to another but each possessing a well defined maximum, beyond which it is impossible to go. If a load be placed upon it in excess of that, the engine will stop and refuse to work longer under those conditions. This necessitates a form of connection between motor and driving group which will permit of some slippage, sufficient to avoid stopping or as it is called commonly, stalling the engine. If this could be designed and constructed so as to hold right up to the ultimate maximum of the power unit, and slip as soon as that were exceeded by the slightest amount, it would be ideal; but such is not the case, as will be shown later.

The hydrocarbon power generator must start slowly, at which time the output is very small. As the speed increases, the power developed is augmented in a proportionate ratio. That is to say, the work which such a motor can do varies with its rotative speed, this being large between certain limits, small when the upper end is passed and very slight at the lower point. The interval between the two is called the critical range.

To be exact, this differs for each and every engine produced, but a general statement may be made as follows: Lower limit, 800-900 revolutions a minute; upper extreme, 1500. Below 800 turns, the power developed will be exceedingly small, and bear a very low ratio to the possibilities above that point, and what is of much greater importance, to what is needed for the propulsion of the car. Let it be assumed that at 550 revolutions the output would be but half of that at 800, the latter in turn, being but 66 per cent. of the maximum.

If the total be needed to start the car from rest, which is reasonable, for in all cases of operating vehicles whether they be railroad trains, trolley cars, or motor trucks, the movement from rest takes many times as much energy as it does to keep it in motion after it has been started, then the highest speed also will be required. This necessitates a form of connection between engine and wheels which will permit of the former being started and run alone, until the maximum speed of rotation be reached, and consequently the greatest power developed, when it must allow of connecting or joining the two gradually yet at the conclusion of engagement, decisively.

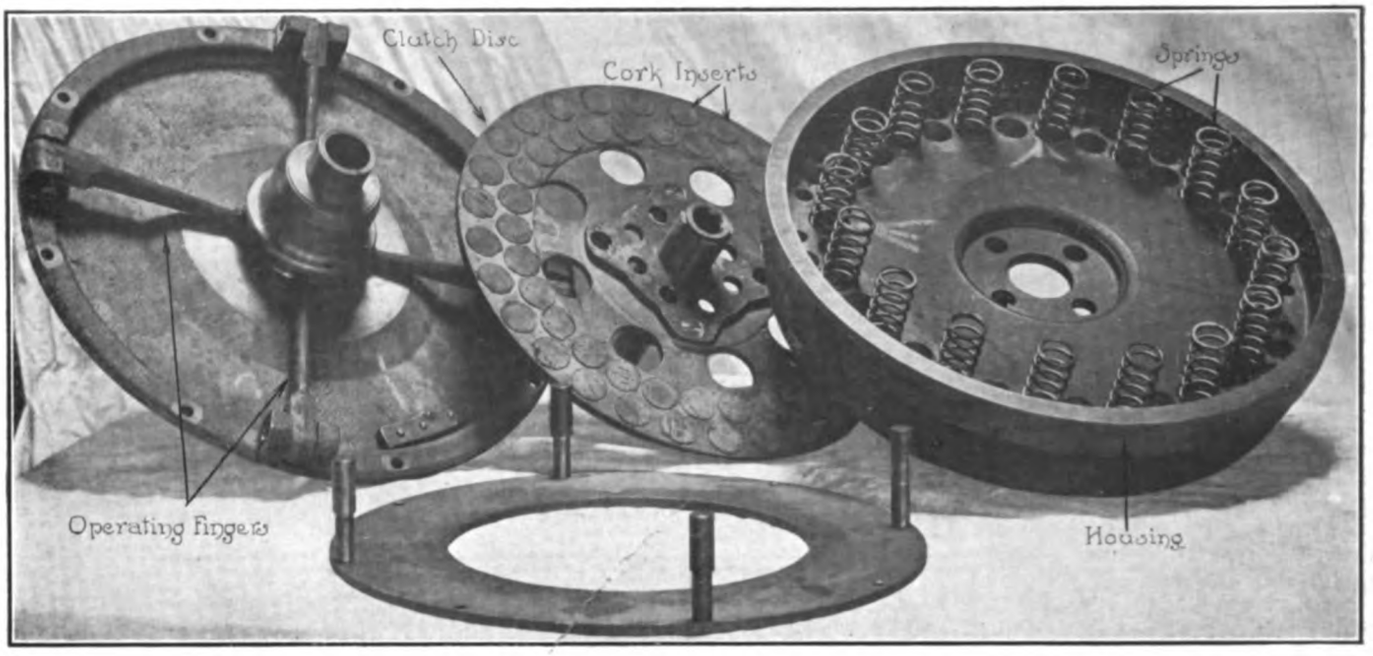
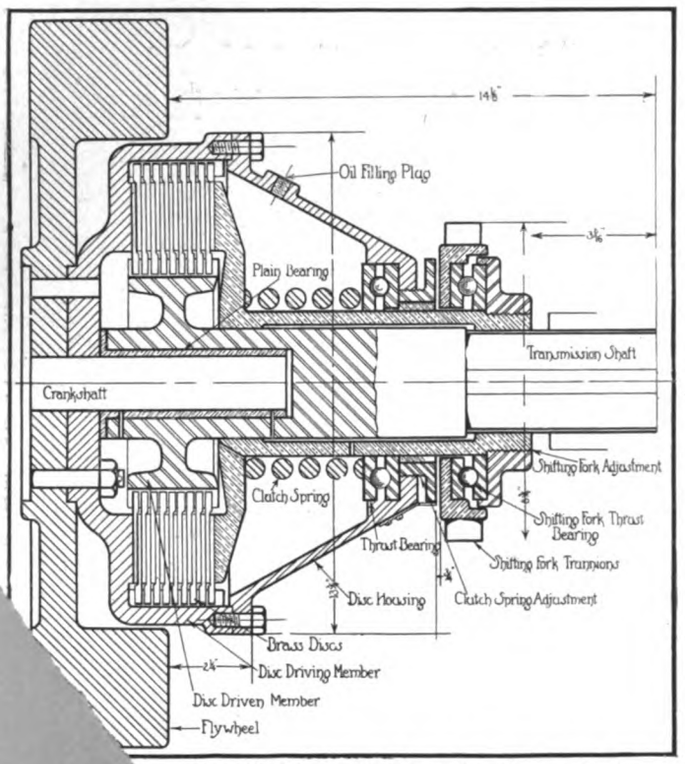


Fig. 53—Cork Inserts Form One-Plate Clutch Used in All Knox Heavy Motor Trucks—Note Numerous Springs in Position Within Flywheel.

After slowing down the car, too, the starting up again must be considered always, since if the motor speed be reduced to a very low figure, while the vehicle is brought to an actual stop or very close to it, the situation is the same as in the first place, and the engine must be disconnected, speeded up to a high power output point, then connected with the driving means. When the large number of starts and stops made during the course of a commercial vehicle's day is considered, the importance of this easy and rapid connection and disengagement becomes apparent. From this point of view the clutch is a large factor in successful and efficient operation.

The clutch fits into the niche created by these three fundamental needs of the motor car, namely First, a slipping member to avoid overloading and consequent sud-

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...vy Plate Clutch of 18 Discs for Severe Railway Car Service—Note Rugged Design.

...econd a disconnecting unit to permit of run-...endent of the rest of the car and so bring ... development necessary for starting and ...d third, a form of flexible connection ...ration at all times is facilitated.

...t the outset that it is closely con-...e method of speed variation used, ... form of the latter is such as to ...parate unit, the transmission ...m the functions of both. In ... friction type, the planetary ...nd other similar de-...mmon use, they ... friction and

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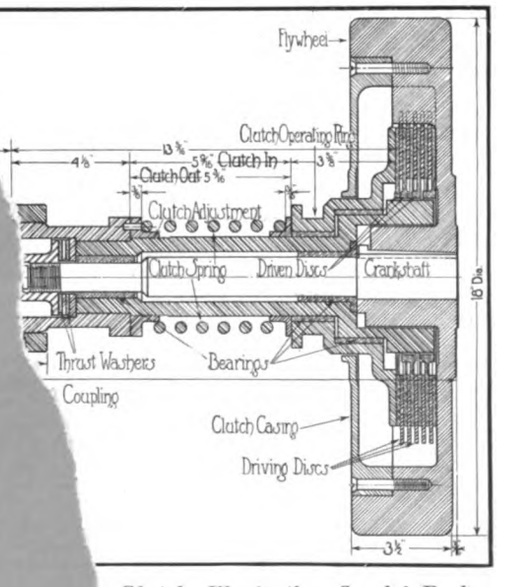
three principal units, motor, clutch and transmission, as individual parts, and in the majority of cases, placed some distance apart. On those of the chain driven type, the gearbox is located at the driving countershaft and many times, as a unit with it. Between the two the clutch position varies with the designer from very close to the power unit or incorporated in its case, back to inclusion with the transmission case, and all of the intermediate locations.

This being true, it can be discussed separately. There are three classes into which all clutches may be divided: Disc, cone, or band. The first is divisible into single plate, so-called, with three friction surfaces, and multiple disc with upward of 10 plates. The second form may fall in one of two divisions, the plain or the inverted cone. The last also is made in two ways, the contracting band and the expanding.

The first class is well represented in the accompanying cuts, Fig. 53 showing a one-plate form, Fig. 54 another with 18 discs, Fig. 55 a form with 11 plates and Fig. 56 one with 15. While the power transmitted in the case of the first, second and last is approximately the same, the difference in the plates lies largely in size and the pressure of the clutch spring. The single disc is of a very large size, within a portion of an inch of the flywheel diameter, while the springs though small are numerous and stiff, yielding a large total pressure. This form also has cork inserts, which supply the larger part of the friction surface, thereby increasing its ability to transmit power. This is the clutch used by the Knox Automobile Company, Springfield, Mass., in its trucks and commercial cars.

Fig. 54 is a design of the writer's for a high powered gasoline railway car to carry 35 passengers. The plates were of a very ordinary grade of brass, cast with the proper lugs and machined only on the contacting faces. The entire job was a very low priced one, but the surface afforded a large margin over any possible requirements. By comparing the size of the flywheel here with that of Fig. 53, some idea of the relative dimensions of the two kinds of discs may be gained, although this last is a slightly larger balance weight, say 21 inches as compared with 18. The extra strong spring will be noted and the generous provisions in bearings and elsewhere for hard work and considerable abuse. Attention is called to the two points of external adjustment of the clutch spring and outside take-up possibilities for the shifting fork thrust bearing.

Another of the writer's railway car designs, but for a lighter vehicle of much less power is that of Fig. 55. Here is seen a more compact arrangement, although the general design of the discs is very similar. The five driving discs carry three slots each around the periphery, which fit over similar notches machined within the flywheel. The six



Clutch, Illustrating Special Design Demounting.

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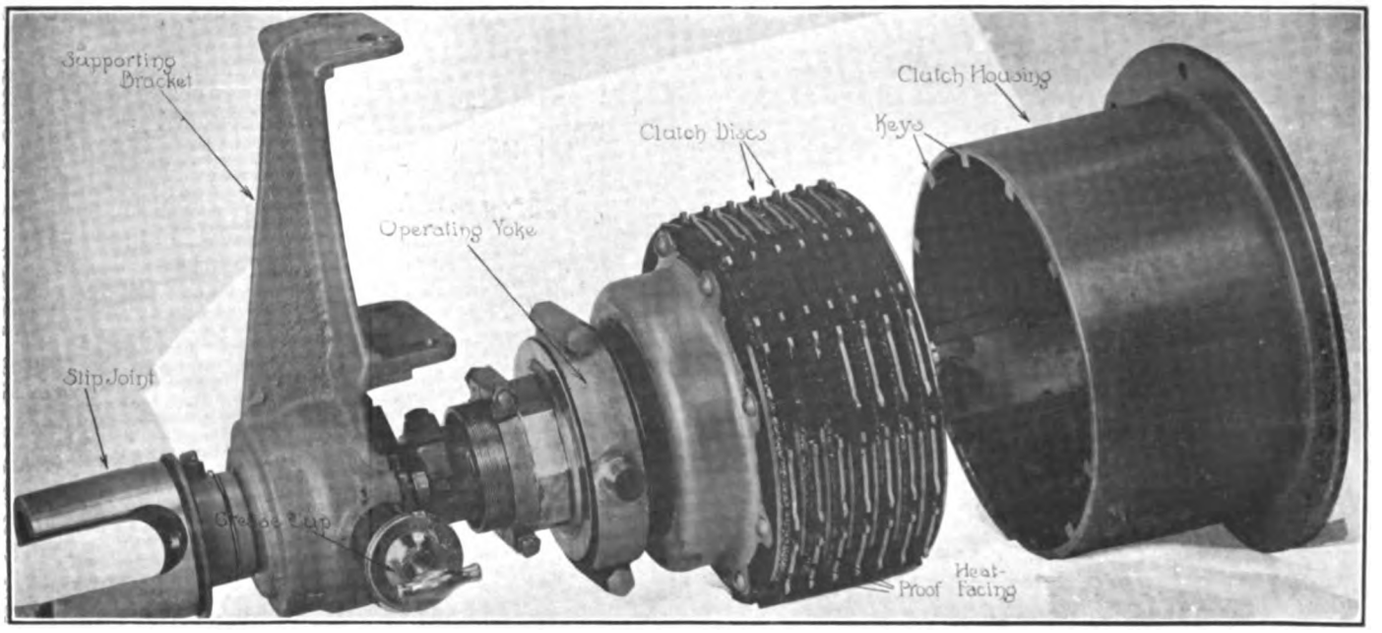


Fig. 56—Type of Multiple Disc Clutch in Which a Large Number of Plates Is Used—Those Shown Are Faced with Heat Proof Material.

driven members each have a hub twice the thickness of the plate, in which is a set of three notches to accommodate an equal number of keys on the driven shaft. The universal coupling at the left was provided for the purpose of quick and easy demounting. By removing a pair of bolts holding the two casing pieces together, these could be lifted off the squared ends of the shafts over which they fit, leaving a clear space eight inches long in which to slip off any of the parts. The spring is of a round section wire of fair size and considerable stiffness.

A series of 15 stamped steel sheets, seven with external notches and eight with internal, form the principal parts of the clutch depicted in Fig. 56. These have a facing of asbestos fabric, similar to that used for brake linings. Other features of this design will be seen in the figure, which is well worth extended study.

Passing to the cone clutch: This may be considered as a disc which has been rolled up, cornucopia shape and the ends cut off. Treated in this manner, it becomes similar to the disc in every respect. The actions of engagement and declutching become a matter of allowing the spring to push the two coned surfaces together or pressing them apart by means of a pedal. In Fig. 57 is seen one of the reversed type, while Fig. 58 is another but double surfaced in order to transmit a larger amount of power. Fig. 59 depicts a plain cone so that a means of comparison is afforded.

The reversed form calls for more parts and has an enclosed spring, permitting of efficient lubrication. The design shown in Fig. 59 of the plain form also happens to show an enclosed spring, but generally this type gives an external position for that important member. Fig. 57 is used in one of the best three and five-ton trucks on the market, while Fig. 58 was designed by the writer also, for a 30-passenger railroad car with a peculiar double transmission. The form in Fig. 59 is used on the Sampson five-ton vehicles made by the Alden Sampson Manufacturing Company, Detroit. Fig. 60 shows a detail of the clutch spring used in the Sampson truck, giving an excellent idea of its proportions, while the preceding figure depicts it in position. The spring in the Mack design at Fig. 57 measured 3.25 inches inside diameter, using .375-inch square wire. It was 5.75 inches long free, and required 225 pounds pressure to bring it down to the four inches it occupied in position. This amount then, was the pressure exerted normally to hold the clutch in engagement.

Aside from the Kelly truck, manufactured by the Kelly Motor Truck Company, Springfield, O., few band clutches are used in commercial cars. This one is of the expanding form, in which a construction very similar to the usual expanding brake is utilized. The drum is driven from the engine and the band is attached to the driving shaft. By forcing it to grip the drum surface, the whole is locked together and revolves as a unit, which is the desired end.

The selection and adjustment of clutch springs is a delicate matter; if they be too free, the member will not take hold, slipping will result, and the engine will be raced to get the desired speed, eventually causing much damage; if too tight, it will grip so quickly and strongly that the car will start off with a jerk, stalling the engine if let in too quickly, and making it difficult to disengage. Truck drivers are advised to avoid tampering with the spring adjustment so long as the part acts correctly.

Similarly, with the friction surfaces: These should take

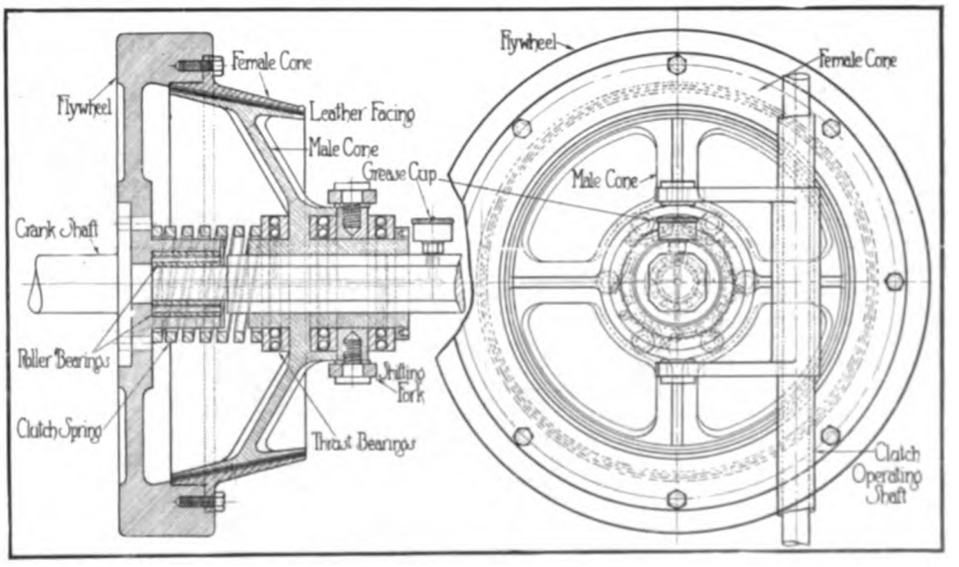


Fig. 57—Standard Type of Inverted Cone Clutch with Enclosed Spring, But External Adjustment, Used on Mack Trucks—Operating Fork at Right.

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hold easily, gently and progressively, but once gripped together should hold right up to the ability of the engine. If slippage result, the surfaces may be too greasy or the leather or other facing may have become oil soaked. When this occurs, it is well to take the member out, clean the surface as much as possible, then soak over night in water. Follow this with a thorough cleansing, using gasoline, and it will be ready to replace. While the part is out of position, roughen the surface with a coarse file. For the first few days, a fine powder may be put on the surfaces, but sand or any gritty form should not be used. The use of powder is inadvisable except as a last resort.

Ed. Note—The next installment will take up the different forms of devices for varying the speed, showing the need for these, the types usually encountered, a number of common forms and their operation.

MILLER'S ADVANCE CATALOGUE.

Those who have come to rely upon the catalogue of Chas. E. Miller, 97-103 Reade street, New York City,

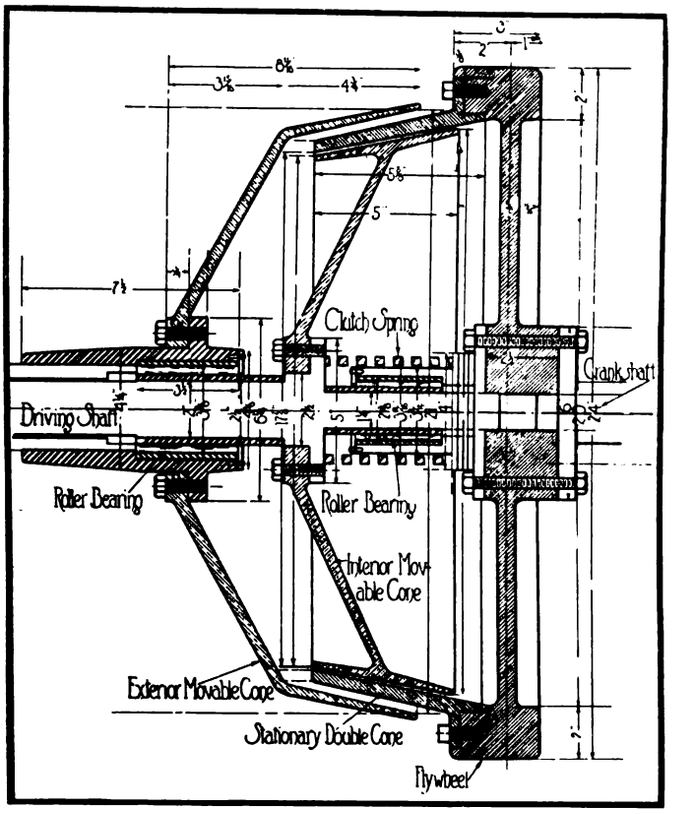


Fig. 58—Double Cone Clutch of the Inverted Type, a Peculiar Form Also Used on a Railway Car.

for information concerning automobile accessories, parts and supplies, will be glad to know that 100,000 copies of the advance catalogue No. 21, for 1912 have been printed for distribution at the forthcoming shows in New York City. As has been true in the past, this is undoubtedly one of the most complete compilations of motor car fittings ever made. The numerous stores maintained by Miller in various cities, make it extremely easy for motor truck owners to secure anything listed by him at short notice, and when it is remembered that Miller is not only a wholesaler and retailer, but manufacturer and importer as well, it is not strange that his catalogue is so complete. It is always possible to secure one by addressing the nearest store or the home office, as above.

NEW HEWITT COMPANY FORMED.

Papers have been filed in Albany, N. Y., for the incorporation of the Hewitt Motor Company, with offices in New

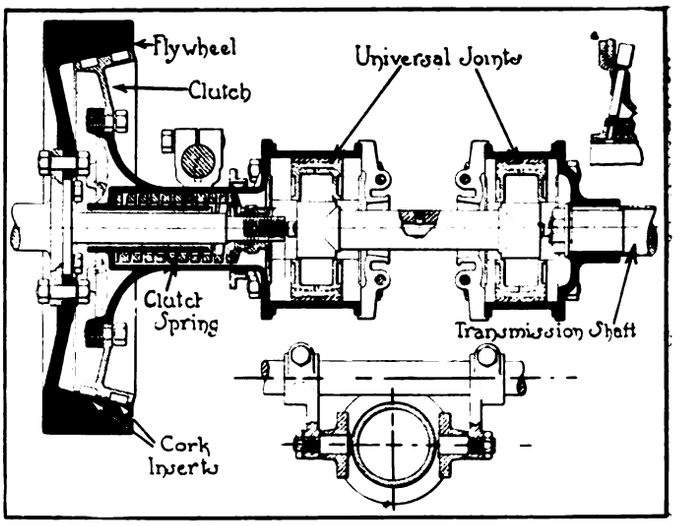


Fig. 59—Straight Type of Cone Clutch with Cork Inserts on Sampson Trucks, and Universal Joint Construction.

York City. The original concern of this name was one of the pioneers in the commercial vehicle industry, being one of the first to produce light delivery wagons and heavy trucks. In January, 1910, it was combined with the Metzger Motor Car Company of Detroit, and Hewitt trucks were sold through that concern's commercial vehicle department at 10 East 31st street, New York City, Edward R. Hewitt, engineer of the original Hewitt company, remaining in charge.

It is understood that the new company has purchased the Metzger Motor Car Company's interest in the truck end of its business, and will begin the manufacture of Hewitt vehicles under its own name at West End avenue and 64th street, about Jan. 15. The directors of the new concern are: M. F. Burns, E. C. Converse, William E. Corey, E. R. Hewitt and Ambrose Monel.

BIRMINGHAM INCREASES EQUIPMENT.

Perhaps no city in the South has given the subject of motor transportation more study than Birmingham, Ala. It will be recalled that the fire department practically has replaced its entire horse equipment with automobile apparatus, and now it appears that Commissioner Weatherly of the street department is about ready to follow its example with respect to vehicles for his work. He says the greatest item of expense is that of transportation, and if motor cars will effect the same saving in his department that they have for the fire wagons he will be justified in making the experiment.

His investigation leads him to believe that one motor truck will do the work of three teams of six mules and three drivers. While no official statement has been given out, it is understood the city contemplates the purchase of five or six automobiles for this department, one of which will be of sufficient strength and durability to handle the garbage problem of the city is a satisfactory manner.

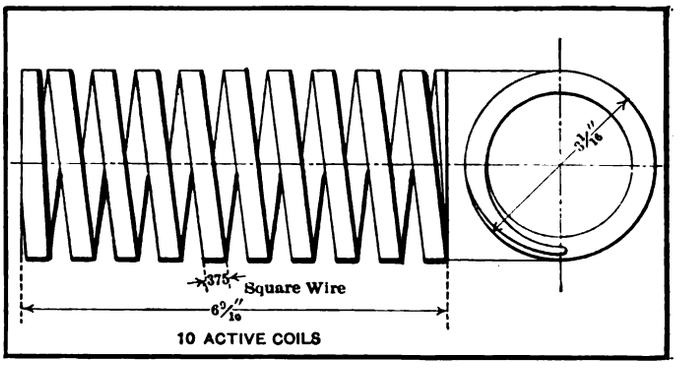


Fig. 60—Detail of the Spring Used to Operate the Sampson Clutch Previously Shown.

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POWER WAGON BODY DESIGN AND CONSTRUCTION.

Service Vehicle Equipment Building an Industry of Large Proportions---It Requires Engineering Skill and Knowledge of Chassis Details, and Entails Specially Developed Facilities to Produce the Special Works.

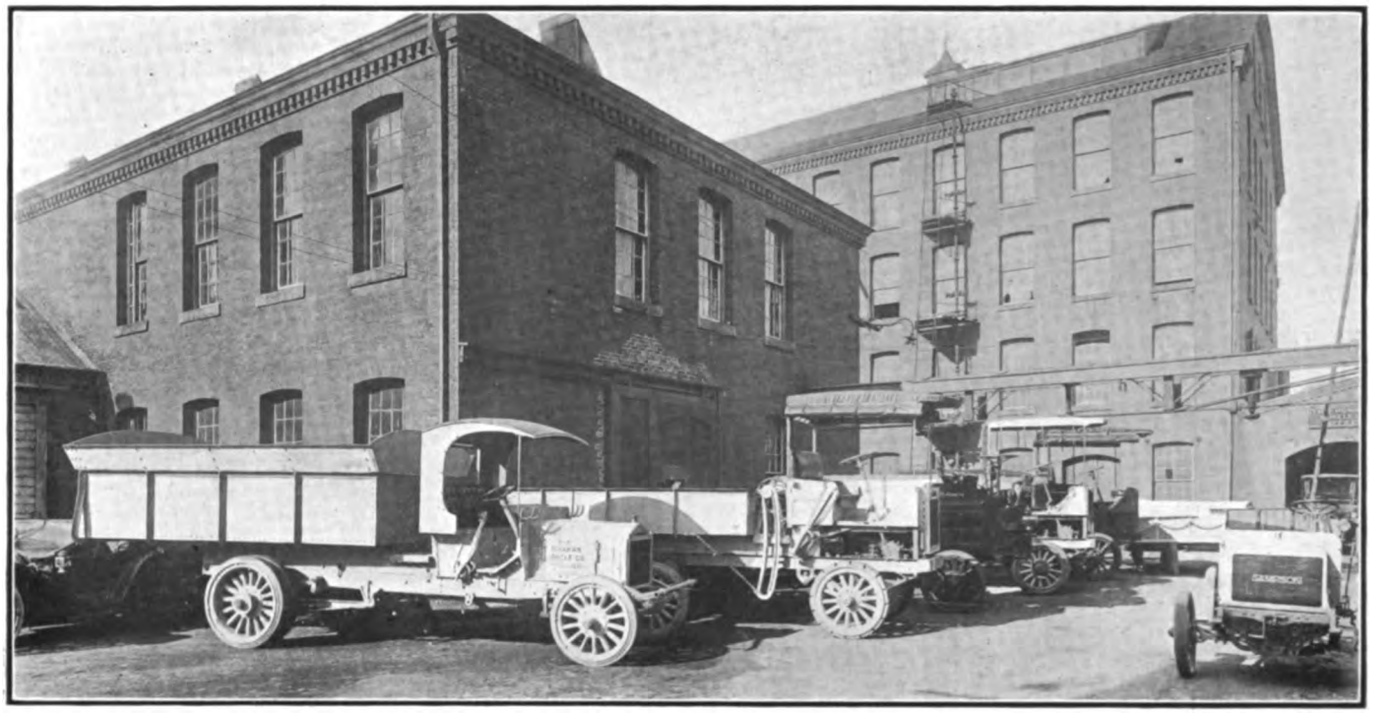
(By William W. Scott.)

THE utilization of the industrial power wagon has made essential specialization in body construction. This has created an industry that is entirely separate from making pleasure car bodies. The possibilities it affords are seemingly unlimited. To illustrate this it may be pointed out that with the greater number of manufacturers of pleasure vehicles from two to a half dozen different bodies are used. There are others who may make a dozen or more types, but all of these are not generally stocked and some are supplied only to order. It is usual for those who produce large numbers of machines to simplify design for commercial considerations—manufacturing cheaply and to reduce the factory equipment. Those who purchase pleasure cars must select the type that is offered or pay for specialization, and special work always costs money.

The manufacturers of pleasure vehicles who began to install bodies on touring car or roadster chassis found that it was not practical to build stock bodies that would meet with approval. So many changes were demanded from the designs created that it was decidedly impossible to give the attention to special work with the ordinary facilities. Then construction to specification was adopted with hardly better results and it was realized that to serve the people satisfactorily it was desirable to supply hundreds of sizes and many designs, which could not be done without material change from the usual method of factory production.

This condition made imperative abandoning special work or equipping factories to produce it, and this led to very general recommendation that the chassis only be delivered to the buyers, they to have the bodies built by local builders who could produce these to exact requirements. Many motor truck manufacturers found it desirable to go outside of their own factories to have bodies constructed to specification and did so to secure equipment for show purposes. The European custom has been for years to deliver pleasure car chassis to purchasers, not furnishing the body unless a few standard types are demanded.

The fact that the makers of industrial vehicles have preferred to devote themselves entirely to construction of chassis, and that the buyers can secure bodies that are in every way satisfactory from those who specialize this work, has developed industries that have assumed considerable prominence. Some of these body makers will take orders for all types of construction, while others will only accept orders for wagon and truck bodies. These specialists



Power Wagon Chassis with Special Body Equipment for Widely Differing Service, Either Built or Installed by the Monahan Vehicle Company, in the Yard of the Works.

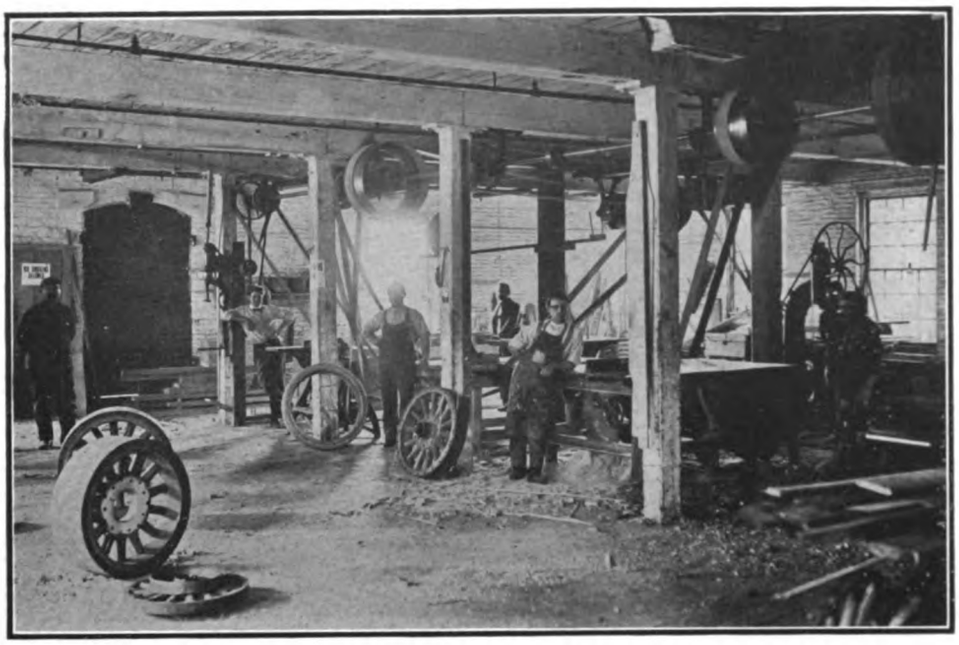
may have been wagon and cart builders, or perhaps firms that were enterprising and realized the fullest benefit from the change from the animal to motor transportation, while others may have taken up a work that has been especially promising.

While those who have adopted motor vehicles for industrial purposes realize the desirability of bodies adapted for their needs few understand that there is quite as much engineering knowledge and practise necessary to produce a good body as is needed to build the chassis. This is not intended to discount the motor vehicle engineer, but to emphasize that high class work to yield service and endure under differing conditions of use must be built from well selected materials, to correct designs and to established engineering principles. Not only this, but to give the satisfaction desired a body should be designed for the purpose for which it is to be used. It may be assumed that a single type of body might be utilized for a great number of purposes, which may be true, but this could only be applied to instances where the work differed as in general haulage, and where an equipment is with reference to diversified service.

It is not to be assumed that body building has been

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fully developed. As a matter of fact the progress, so far as power wagons are concerned, relates to the requirements of a small proportion of those who have utilized highway vehicles for business. It is rare indeed that stock creations



Section of Woodworking Department, Where the Rough Stock Is Cut and Formed for Body Components to Specification Requirements.

are produced. With few exceptions the bodies built have been to meet the needs of individuals, the ideas being developed by practical designers and builders.

There is in service construction much opportunity for creative work, but ornamentation gives way to simplicity, for at most paint and varnish can only please the eye and add nothing whatever to productiveness. It is not possible to construct a stock of bodies and to deliver one or more when a customer makes demand, because there is usually so much variance. Not only this, there are quite as many differences in the chassis as there are in ideas, and it would be the height of folly to attempt to sell what is not wanted at a price but comparatively little less than what would be charged for a special order. What is wanted in a body is, as a rule, substantiality and capacity, and yet it must have an appearance that is not unsightly when contrasted with all or many other types.

It may be emphasized here that there is with many a desire to have what will attract public attention because of the advertising benefit that may be derived from the constant use of vehicles in a community. Just what this value may be is decidedly uncertain because there can be no measure applied to it. There is no question that public opinion is always desirable, but prestige is mainly sought by those who do business, and this means favorable comment. This develops the fact that the body builder who would please and attract patronage must be able to produce what will have every desirable quality of other forms of vehicles, be sufficiently original to develop what will serve all other purposes as well, and yet be governed by competition so far as the price is concerned. Not only this, some men desire to incorporate in the one vehicle what will give them equipment for widely varying service, and to meet such requirements impels careful study and a knowledge of fittings and accessories. As an illustration, frequently a demand is made for a combination that will afford both freight and passenger service, or for the transportation of two forms of commodities, such as grain and lumber, or contracting materials, or coal and merchandise.

An example of the development of body building to specification is illustrated by the Monahan Vehicle Company, Providence, R. I., which has for several years built bodies for power wagons and trucks, and which has distributed its products all over the country. This concern was originally engaged in constructing animal vehicles, generally of a business character, and with the adoption of the automobile to industrial purposes demand was made for bodies, for the first machines to be used had been given more or less service for pleasure. This necessitated the creation of whatever would meet the requirements of the owners of the chassis, within the limitations of the original construction, though it was often necessary to make material changes and modifications in the ideas originally outlined by them.

This work was largely of an experimental character because of the lack of knowledge of service conditions and with no experience save with animal conveyances. With this foundation other work was undertaken. The production of power wagons was begun and this created a demand for special bodies for varying purposes. The total of differing demands made upon the concern in the period it has engaged in this work is not certain, but it is safe to assume that in all considerably more than 100 different



Another Wood Working Division, Where the Body Parts Are Finished and Each Job Is Made Ready for the Assembly.

designs have been produced. The exact number would be interesting to know, but as it now does business the company has catalogued no less than 40 different designs in 149 different sizes of body which are classed as regular

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or standard products, all of which may be fitted to all pleasure and industrial chassis. This, however, does not represent the possibilities of construction, for the concern is prepared to undertake whatever may be desired. While the number may seem large it may be said that this does not represent by any means the extremes of the demand for service machines, and it is well within probabilities to state that there are at least 500 bodies in use that may be regarded as business types. This is a far greater number than is to be found with pleasure vehicles, both horse and motor conveyances.

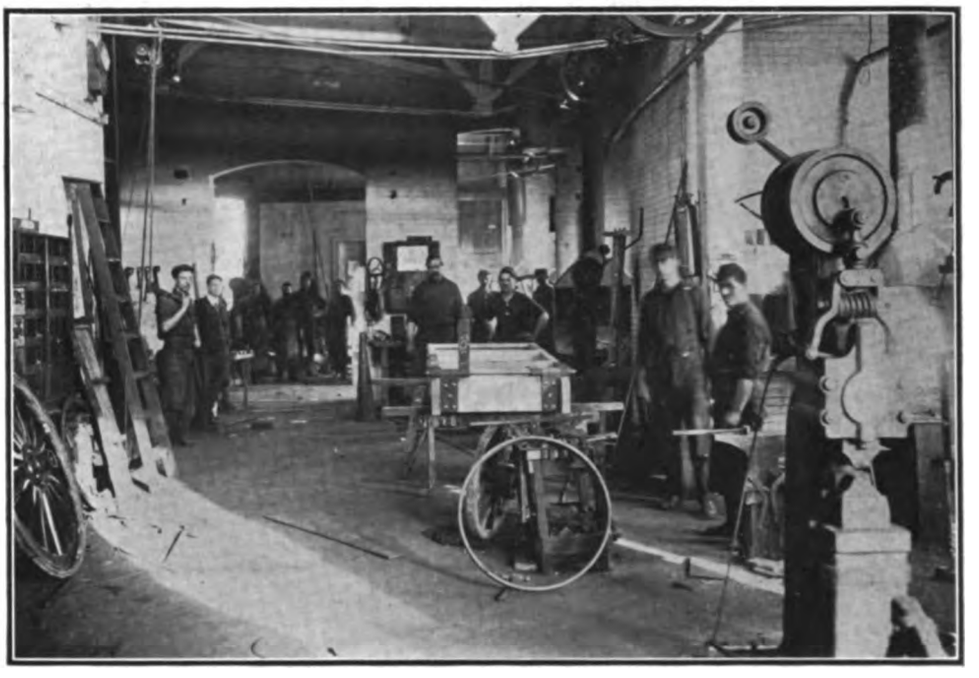
Besides these the company produces bodies that are designed for heavy work and it has recently turned out a number of equipments that are for exhibition purposes. These will be seen at all of the principal shows this winter. Some of the bodies are of wood, some of metal, some combinations of the two. The capacities range from 1000 to 16,000 pounds, and it might be said that the only limitation is the proportions of the chassis.

The first consideration in body construction is the use to be made of the vehicle. No matter how experienced a man may be with his service and how carefully he may have planned he lacks the knowledge of actual body building that is essential in establishing even fundamentals. As a matter of fact it is often best for a man to consult a body building firm just as he would an architect when he desires to erect a house or building. He may know what he wants in a general way, but to secure the best that is possible with the limitations of the chassis becomes a problem that cannot be worked out without exact knowledge of the service, the highway conditions, the character of the loads and the construction of the chassis itself.

To illustrate this an instance may be cited when the first truck chassis produced by a leading manufacturer was purchased by a very large concern and the purchaser decided to have a body built by the Monahan company. An executive visited the works and described in detail what he wanted. He asked for an estimate and was seemingly disposed to dismiss the subject with his description and his broad order. The designer of the firm noted the desires and inquired fully into the details of service. Then the chassis was examined and its dimensions learned. With this a body was designed that, when submitted, was pronounced by the manufacturer to be exactly what he wanted, but as a matter of fact it was in every way different from what had been described. Not only was it impossible to build what had been first ordered, but from an engineering viewpoint it would not have endured. The designer learned the requirements and then adapted them to the chassis with exact knowledge of materials, construction and the service, producing what was also sightly and substantial and a fitting combination of dignity and serviceability.

In industrial service it is often necessary to create what will be a combination vehicle, that will serve for more than one purpose, and sometimes these purposes are so widely different it would appear that desirable results can only be obtained by sacrificing essential qualities in either. It is not the owner who is qualified to decide such propositions, because he does not understand the limitations and the possibilities. It is also a fact that the makers of the chassis do not construct them with a view of extremely diversified service. It is true that chassis are built for differing purposes but the measure of capacity is by load only, not by proportions. Then in making installations to meet the desires of the purchasers it is necessary to be governed by certain mechanical conditions. Were it possible to take a chassis of a given make and capacity and lengthen or shorten it, or make it conform to body proportions, that would be ideal from the viewpoint of the purchaser and the body builder. But as a matter of fact such changes are rarely possible and the body builder must produce what will best serve the purpose of the owner with reference to the limitations, for with the majority of the manufacturers changes in the chassis would nullify the guarantee, and the guarantee is one of the strongest arguments that can be made by the builder for the sale, and by the purchaser for the purchase of the truck.

It is apparent that no such conditions govern the construction of the animal vehicle. There is nothing to be considered save the storage space or the area in which it is to be loaded or unloaded. The limitations as accepted for animal vehicles by manufacturers are generally established by the makers of components, such as axles, wheels, and the like. With purchasers the capacity is gauged by custom or by supposition. The metal work is designed for bracing and strengthening the construction without particular reference to anything else than endurance. The wood work is cut to pattern and assembled with service as the chief essential. So far as design is concerned any work may be varied to serve any requirement and there is no prohibition as to adaptation. With manufactured vehicles certain types are selected as best meeting with the demands of the people and these are built in such quantities as the market justifies. These are carried in stock as standard products by vehicle dealers.



Looking Through One Side of the Blacksmith Shop, Showing the Tool Equipment and a Bolster for a Pierce-Arrow Truck to Have a Five-Ton Dumping Body.

While it is certain that there eventually will be as largely diversified production of mechanical industrial conveyances as there has been in some instances manufacturing of animal transports, it is equally certain that there will be a very large number of chassis makers who will entirely divorce the body work, even for their own service. It does not require more than casual observation of conditions and needs to establish beyond question that pleasure car chassis building and body construction are being more widely separated each year. While the business of the one governs the other it cannot be denied that the two are separate industries.

There are those who demur at paying the prices demanded for special body work. It is held by them that there should be the same relative cheapness to be found in stock productions. The contention is made by men who do not hesitate to pay well for animal vehicles that because an installation must be made on a chassis that must be

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bought outright the first cost of a body is high. As a matter of fact such is not the case. The chassis is sold without equipment and in competition. To the price of the chassis must be added the value of whatever body will serve, and this body would cost the chassis manufacturer no less, and probably more, than it would were it built by the exclusive builder. Any custom work must of necessity cost more than what is manufactured in quantity, but there is not the usual wide difference between the two to be found in motor wagon body building.

While this difference would exist were each body a separate creation and were each designed especially it is apparent that where designs have already been made, which may be utilized, or slightly modified to meet requirements of the customer, the exclusive body maker is prepared to give the benefit of his experience and facilities at what may be regarded as moderate cost. The body making firm is as a rule better prepared to give service than is the chassis builder, for with it design and construction have been developed and perfected, while with the chassis manufacturer the body equipment is secondary and, as a matter of fact, it is often to order from body builders who are compelled to charge special prices for what is justly regarded as purely custom work.

There are in the United States nearly 200 different enterprises building service vehicles and these produce from one to nine different types of chassis. A list of 50 of the leading concerns recently analyzed shows that these firms built at the time the compilation was made 150 different types, or an average of three each. It is not to be assumed that all of these, if fitted with standard bodies, would meet the requirements of the purchasers. As a matter of fact of the number stated 13 built one type only, 10 two types, 11 three types, six four types, five five types, three six types, one eight types and one nine types. One may imagine the diversity of demand upon the maker of one chassis that may be suited to many forms of transportation should he construct bodies for all purposes.

It undoubtedly is a fact that there is no limit to the variance of requirements when each purchaser selects what he desires. There may be limitations, but these are not often considered or regarded, so far as conventionalities are concerned. There is a desire characteristic of human nature to improve whatever is brought to one's attention, or to make adaptation to one's use. It is this that has caused the demand for differing creations, and it also is a very human desire to be satisfied.

But, as has been pointed out, it is quite impossible to have every requirement within the construction possible on a single chassis, and furthermore it is not possible to take a chassis and change it to permit the installation of a body such as might be wanted. Then obviously the one means open is to purchase the chassis that will nearest meet the dimensions of the body required. Then comes the matter of expense of chassis and the cost of the body, to say nothing of the transportation charges.

As the subject of body building is considered it is obvious that there are some types of chassis that more nearly meet with the recognized standards of body builders. It is possible that in the designing of these chassis more attention was given to the probable uses and the demands of the purchasers, and some thought may have been devoted to the problems of the body designer. It is seldom, however, that a power wagon chassis is bought with an idea of it being particularly suited to the design of body with which it is to be utilized. It is hardly necessary to point out that durability and economy of operating expense are the essential factors that influence the majority of the men who buy mechanical transports. Often decision is reached only after careful consideration of every phase that has presented itself, and then it is found that the most vital quality, that of body installation, has been overlooked.



A Glance Through a Corner of the Trimming Department, Where the Upholstery Is Cut and Made Up and the Tops and Curtains Are Made Ready for Installation.

This oversight may be from the ignorance of the owner, the neglect of the agent to give the body the attention this detail deserves, or the assumption of the buyer that a manufacturer or body builder can make any provision whatever to meet requirements. It is extremely probable that the average maker of bodies is better versed as to the possibilities of each make of chassis than is any given chassis builder, and were a purchaser to consult a body maker before the purchase with reference to the possibilities of the chassis some exceedingly useful advice might be obtained.

As has been stated the buyer has need of specific service as a rule and in the selection of a machine will perhaps follow his own judgment, or may be guided by the experience and advice of others. Let us assume that the chassis is designed with the greatest care and that it is constructed with reference to design. Every component is proportioned

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with knowledge of the requirements up to maximum load and a reasonable margin of safety is provided. But the chassis ought to be used as purposed by the designer. The load must be carried with the weight distributed on the chassis and on the tires as was designed, for were the freight not so carried there would be undue or unequal stresses on differing parts and weaknesses might be developed.

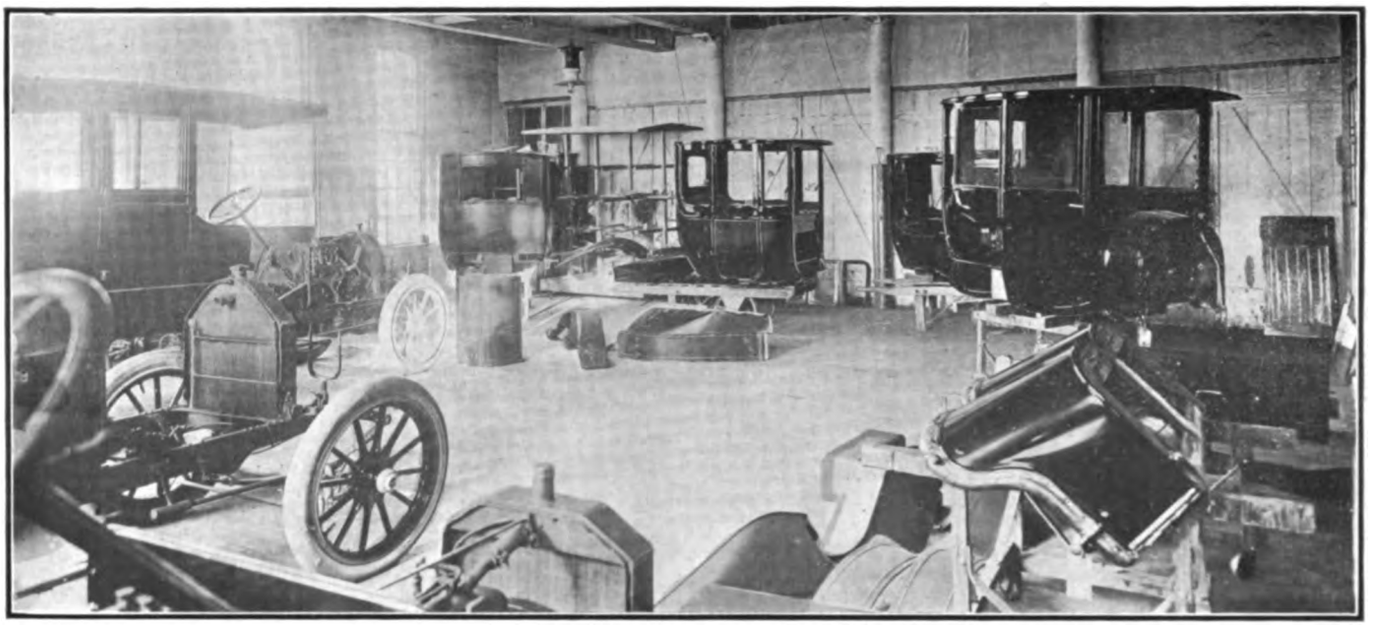
This statement has been made because the subject of the chassis is first, last and all the time, and the design of body equipment is dependent upon the chassis and its arrangement. The statement has been made that engineering skill is just as necessary in correct body building as in the production of the chassis. This may be emphasized by pointing out that a mechanic may produce a motor vehicle, and the same man may build its body, but neither will be as finished nor as satisfactory as were they constructed to recognized detail and by adequate tool and machine facilities. Nor will either be as acceptable when offered for sale.

While the usefulness and value of a chassis may not be affected by the character of the body installed upon it its serviceability will depend to a large extent upon the form of the equipment. Obviously then it is desirable to have what will give the greatest measure of service. In bodies in which but one purpose is to be served it is not difficult to determine what form will best be adapted to requirement.

Body building for power wagons as an industry means that there must be factory facilities, but not of the same character as were pleasure cars produced. Where several types are standardized, as with a complete automobile plant, or where many types are built in large numbers, as in an exclusive car body establishment, manufacturing methods to standard patterns and templates and by specially fitted machinery must be adopted for economy and profit. This means that the work is departmentalized, beginning with a drafting room, where the bodies are designed, or where the working drawings are made, and including the wood working divisions, the tin or metal working shop, upholstery and the painting and finishing rooms, each as complete as may be required by the character of the work produced. With these after a design has been determined the body is completed according to a regular working schedule and it becomes merely a manufacturing proposition.

So far as detail is concerned a body is created to have certain appearance and is to specification. Each is assumed to be equally good and to differ not at all. Where there is special work this may apply to a change in color, or perhaps in the tone of the leather upholstery, or possibly a monogram or design is placed on a body, but the work and materials are identical. While the number built may be one or 50 a day there is no change made so long as this type or types are turned out, and it may be that one change a season is all that is made. As a matter of fact in some instances the same type has been made for several years. It is certain enough that manufacturing under such conditions means minimum of expense and uniformity of work, two excellent factors from a business point of view.

The power wagon builder must have even greater facilities than has the body factory, for each work turned out is in itself a separate order. This in a nutshell shows why it is that the cost of the service body is necessarily more than where bodies are manufactured in considerable numbers. The plant must be sufficiently large to undertake whatever commissions are received. It must have a drafting department and capable men must be employed who are competent to produce whatever is desired. They must have greater and more diversified experience than those engaged in ordinary body manufacturing and not only have a careful engineering education, but be familiar with the design, construction and requirements for each type of chassis upon which they are called to work. This means that they are specialists in every sense and capable of taking any problem of vehicle design, including both chassis and body, and successfully solving it. This work is broader than that in which the motor vehicle designers are engaged because it is not one but a succession of problems in each of which economy, service and appearance are all important factors. As must be evident these men are not easily secured, for there is no education that will fit them and their knowledge must be gained from experience.



In the Painting Shop, Showing Bodies and Chassis in Varying Degrees of Finishing, These Being all Pleasure Cars.

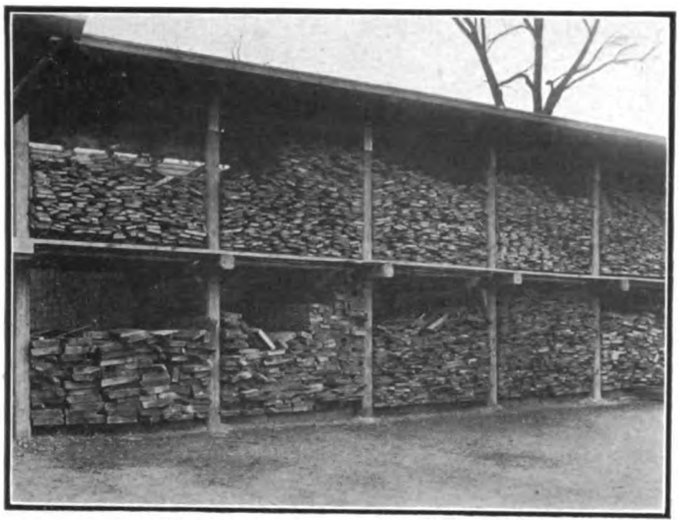
After the designing or drafting room the facilities must be complete in every way. First is the wood workers, where workmen must be capable of taking a blue print and from it forming the different wooden parts, not to patterns or templates, but to engineering dimensions. In this work the men necessarily must be of experience and capacity. It may be that these men will have for months no work that is in duplicate. Such work is not as rapidly produced as is one series of parts, despite experience and high class facilities.

Next is the machine shop in which all special iron and steel work is produced, this from the parts in the rough or by adapting whatever of the constructions may be available. The machinists must be skilled men who can undertake any job and do it well. They must have ample facilities. The work may be for the heaviest truck or for the lightest and most artistic construction.

The third department is the blacksmith shop, one of the most important, because each work requires special construction, differing in size and form, and shaped from iron or steel, which must be produced by hand. These men must

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be able to take a blue print and make whatever has been designed to exact proportions, just as are the wood workers. So capable are skilled men that they can from drawings make what may be installed without fitting. The extent



Stock of Selected Wood for Body Building, Each Kind and Thickness Being Separated, Showing Quantity Required for Ordinary Needs.

of the blacksmithing necessary on a truck body is seldom realized until it is collected for installation. All smith work must be finished that it may be painted and varnished, and this necessarily requires time in addition to the forging.

Next are the metal workers, for bodies may be of wood or combinations of wood and metal, or of metal alone. These men must also have large experience and be qualified to do any job. This applies to all classes of metal from tin to aluminum, from delicate brass sheathing to heavy plates of steel for bodies for coal and similar haulage. The equipment must be not for one class of construction but for everything that occasion may demand.

In every department the tool equipment must be sufficient to meet with every demand. Naturally every machine cannot be constantly productive, which is another reason for cost.

The upholstery and trimming department must be equally specialized and the workers must be capable of doing any job to a standard and in keeping with any particular effect sought. In this work the materials are cut to special patterns and these generally differ. This department makes the seats, cushions, backs, lining, tops, curtains, shields, dust covers, hoods, boots, etc., together with work to meet certain ideas not usually applied.

The painting department must be able to handle anything, this ranging from a simple coat of lead to the highest finish that can be applied, for some of the bodies are given as careful attention as though intended for ornament instead of service. The workmen must be broadly experienced. The decorators must be artists, for frequently painting of high class is executed on bodies that must bear close inspection but endure under the severe climatic changes. Men of this class command large wages and their work is exceedingly varied. The facilities for work must include dustless rooms that are well lighted and space to handle any reasonable number of jobs.

The supervision of the work is necessarily exacting and requires men of unusual ability, for each job must be given detailed attention and nothing can be neglected. No contract can be systematized, and consequently construction must be without regard to the usual methods of manufacturing. From the arrival of the owner of the chassis, or his correspondence, each body constructed is a separate order and as such must be given a care in production that would ordinarily be devoted to an original in a body manufactory. The inspections must be frequent and thorough and each process or stage followed by the designer to make certain that the specifications have been met.

It will also be seen that in designs that are original construction cannot be experimental, and where special service conditions are to be dealt with safety entails a large margin of strength. This requires a considerable excess of stock as compared with what might be believed, and material selected for heavy work must be of the best to be enduring. With the large builders all metal bodies are frequently ordered and some produced are of steel, this requiring workers who can undertake such construction. It is exceedingly probable that this type of body will eventually be adopted for many vehicles, for it undoubtedly has greater endurance and is less susceptible to average conditions of service.

Each special body builder must have a stock of material that will meet with any requirement. Ordinary lumber will not serve and what is generally used is high class, although the difference may not be apparent in the rough stock. The sills, posts, crossbars, bolsters and the like must be of fine, hard wood, and the panels must be material that will endure similarly. It is not unusual to use wood that



Another Section of the Painting and Finishing Shop with Pleasure and Service Vehicles in Differing Stages of Completion.

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costs as high as 25 cents a square foot when purchased, and 15 cents a square foot in the rough is a common price. This is for lumber of an inch or less in thickness. The stock must be carefully selected and some firms have standing orders for certain material with dealers who deliver whatever is available from each lot received. The wood is carefully stored and protected and for each work it is picked to meet the specifications. To maintain a sufficient quantity of well seasoned lumber is a problem of considerable proportions for it is becoming higher in price and more difficult to obtain each year.

Regarded in the light that has been given it appears that there is abundant reason for the cost of special bodies, and that those who have purchased stock animal vehicles cannot base judgment as to prices upon the valuations they have paid for such equipment. It also is apparent that to give the same class of work to their customers the chassis builders would have to maintain facilities of large proportions.

The accompanying illustrations show some of the departments of the Monahan Vehicle Company, Providence, R. I., which is widely known as a specialist in motor vehicle body construction. These are working pictures and show conditions as they have been found during one day's activities. It is not to be assumed that it is possible in pictures of this character to give a clear idea of a day's work, but it does demonstrate the character of facilities that are necessary, and that the statement that such an enterprise is an industry apart from but allied with the general proposition of motor vehicle building is well founded.

These views do not show the drafting room, the office, or the stock rooms, for it is necessary to carry a considerable value of standard parts such as nails, bolts, rivets, nuts, screws, pins, wagon and carriage parts and fittings, rims, tires, hardware, upholstery and trimming materials, paints, colors, varnish, brushes, gold leaf and decorative stock. While it might be possible to purchase such material in small quantities this obviously would not be economical.

One of the most important departments is that in which is kept the drawings of every vehicle and vehicle body produced, so that it is possible by records to refer to any specific job and to illustrate the possibilities with any chassis that has been dealt with in the work produced. This series of drawings naturally covers a large number of types, but it does not cover every machine that has been built.

Ed. Note—The following articles of this series will take up systematically varying types of bodies and their design with reference to differing service conditions, illustrating them with practical constructions now in use.

NEW DEMOUNTABLE SOLID TIRE.

A new demountable solid tire, the feature of which is that by its use both single and dual equipment can be changed without removing the wheel from the vehicle, has been brought out by the United States Tire Company, New York City. The device should appeal to owners of commercial cars as replacements may be made by any ordinary workman in less than one-half the time required with styles that heretofore prevailed. While there are forms possessing demountable features which admit the removal of the tire without taking off the wheel, the new product is said to be the first applicable to both single and dual members.

It meets with all requirements of specifications adopted recently by the Society of Automobile Engineers and will be known as the United States standard demountable. The demountable features are possible through making the inside diameter of the tire band .375 inch greater than the outside diameter of the wheel. For example, that of a 36-inch tire is 30.375 inches; the outside diameter of the standard wheel for a 36-inch tire is 30 inches. This additional size gives a clearance between the tire band and the wheel band of .1875 inch, all around the circumference, which clearance makes it impossible for the former to rust or freeze to the latter, as they do not come in contact.

Into this open space wedges are forced which are a part of the flanges, pulling them in and making a good tight joint by the use of bolts running through the felloe. These wedges are of a 20-degree angle at the top and flat on the bottom. The top of the wedge comes in contact with a corresponding bevel on the underside of the tire band, forming a seat and giving metal to metal contact of about .75 inch on both sides of the tire. These wedges are so designed as to remove all strain from the bolts.

The action of the weight on the tire is to press the flange wedge directly onto the wheel band and as it seats there flat, there is no tendency to spread the flanges. The equipment for a single tire is an outer flange wedge, an inner member and nine, 12 or 15 bolts and nuts, depending upon the diameter. That for a dual wheel is the same with the exception that it has a centre wedge in addition to the flange members.

All the latter are split which allows them to be drawn up tight and permits of greater variation in the circumference of the wheel. The holes through these flanges for the bolts are elliptical and the difference between the outer and inner edge flange lies in the fact that the latter has oblong, square cornered bolt holes and the outer has round cornered elliptical openings. Those in the inside flange are square so as to hold the square shank of the bolt and in this way prevent its turning.

The tire itself is made exactly as the Continental solid form, produced in Hanover, Germany, and is built on a steel band with a layer of hard rubber between the band and soft rubber tread. The band is of a high grade steel, .5 inch thick with a serrated periphery so as to form a dovetailed seat for the hard material, giving this joint additional strength. After the band is cleaned thoroughly, the hard rubber is laid around it, being forced into the serrations, and the soft material is then fitted. The tire after being cold pressed is vulcanized in one heat, making a solid mass from tread to base. It is constructed in accordance to the size adopted as standard by the S. A. E.

Several have been on test cars for some time and one was examined after 5200 miles of service and found to have worn but .375 inch.

LOCOMOBILE ANNOUNCES NEW MODEL.

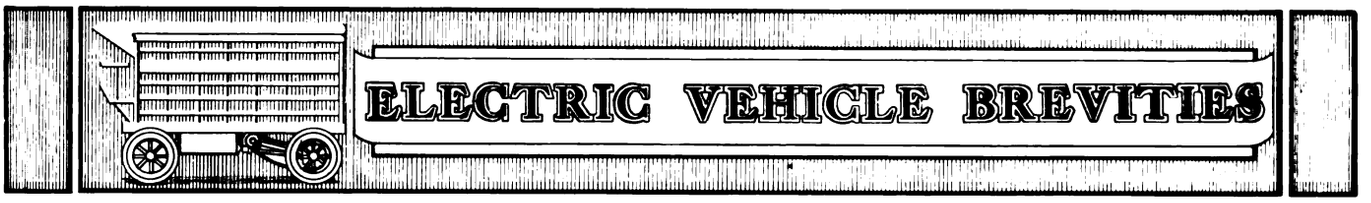
Among the new vehicles to be shown at the coming display in Madison Square Garden, New York City, will be a five-ton truck produced by the Locomobile Company of America, Bridgeport, Conn. The concern is said to have been working on this model for the past two years and to have incorporated several new features in its design. The power plant is a four-cylinder motor with bore of five inches and stroke of six, with four-speed transmission and chain drive. The driver's seat is located over the engine.

Last summer one of these machines was subjected to a severe road test after which it was disassembled to note any undue wear. Loaded with 6.5 tons it was driven 9000 miles, three test drivers taking turns during the 24 hours' continuous service. The subsequent inspection failed to develop any defect.

WHERE COMMER TRUCKS ARE UTILIZED.

During his recent visit to the Kingston, N. Y., plant of Wyckoff, Church & Partridge, Inc., New York City, maker of the Commer trucks, H. C. Underdown, managing director of the Commer plant in England, spoke of the number of these machines in service in the various countries of the world. In addition to the large number being operated in London by various industries, the British war office has adopted the Commer after trials lasting over two years. The Russian war office owns several of these vehicles, one of which won the gold medal in the official trials of 1910. In Calcutta, India, the fire brigade has given repeat orders for two years, while orders have been filled in the Argentine Republic, Patagonia, Peru, and other South American countries, also in Russia, the Penang Peninsula, South Africa, Colombo and Ceylon. In Australian centres there are more than 150 of the automobiles in service. Mr. Underdown expressed great satisfaction at the wide distribution of Commer cars in this country through the efforts of Wyckoff, Church & Partridge, Inc.

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Few people, even those in the automobile trade, have an adequate idea of the number of electric vehicles utilized in the brewery industry. The General Vehicle Company, Long Island City, N. Y., has compiled statistics which have been incorporated in a neat booklet and circulated among the brewers. This company recently passed the $1,000,000 mark in sales which is a new record for machines delivered to breweries.

According to the booklet, 67 different breweries are using General Vehicle electrics, of which number eight have no less than 196, or an average of 24 trucks each. Over 200 are of the five-ton capacity, besides scores of 3.5 and two-ton trucks. Each five-ton keg vehicle has a capacity of 50 full half-barrels or 75 to 100 empties, while the 3.5-ton bottle automobiles have a capacity of 110 cases of two dozen pints each.

It is estimated that the breweries of the world employ not less than 100,000 horses, which is a fair field for displacement by the mechanically propelled vehicle. It is also pointed out that the machine has 100 per cent. greater daily efficiency than the best horse and that the life of the former may be made almost perpetual, whereas that of the animal is limited approximately to about four years.

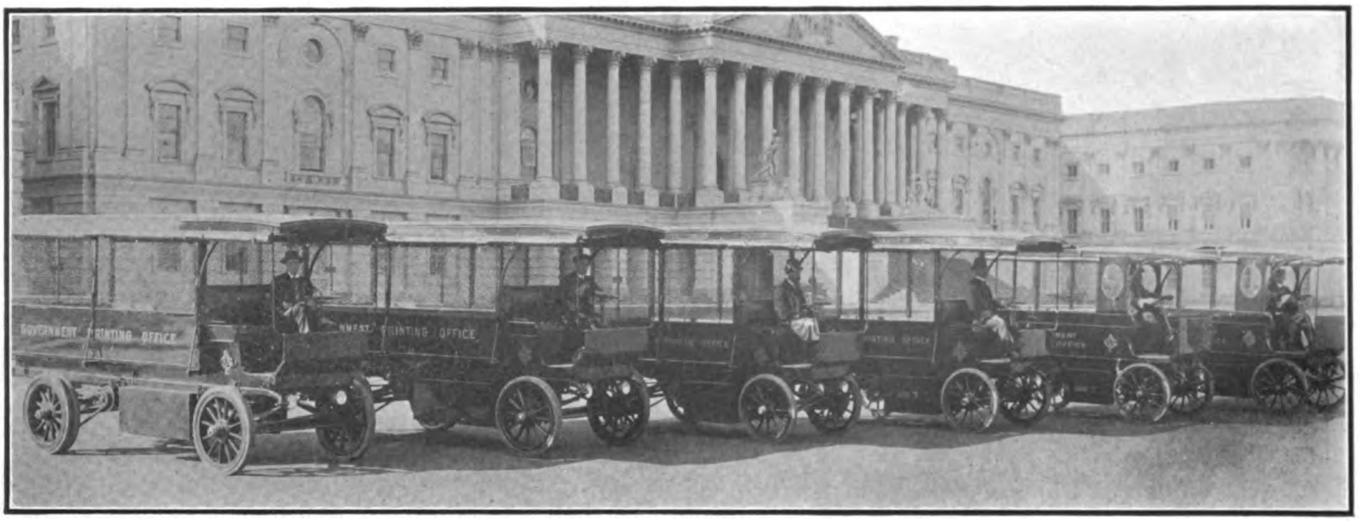
Attention is called by the company to the fact that some of the veteran trucks have been in service over 10 years, and many improvements have been made in models in recent years. By replacing wornout parts as required, and by giving each machine proper care, users may charge off as low as 10 per cent. a year for depreciation, as against 25 per cent. for horses.

The booklet states: "The motor truck did not become a success from the standpoint of either efficiency or economy until makers realized after expensive lessons, that commercial cars must be built on a business car basis. Sales today are increasing at a rapid rate because the business world realizes the passing of the horse and because so many automobiles are making good in their respective fields. They earn money for their owners because they save it.

"A few years ago a brewery of New York City employed over 120 horses, a large number of heavy wagons and had no automobiles of any kind. In March, 1909, after experimenting with a General Vehicle electric truck the concern ordered a second machine and soon after purchased six more. A year later a repeat order for 18 was given, and the concern now operates a fleet of 30 with six more ordered.

"According to the superintendent of the brewery the machines have effected a saving of $25,000 a year. The number of horses has been cut to 50 and business has increased greatly. Half of the stable, which was 200 by 100 feet, has been remodeled and is being utilized for a bottling plant and shipping room. Back of this was a wagon yard, and in this space a garage 100 by 85 feet, and two stories in height has been erected, accommodating 48 trucks. Plans are being formulated for a garage to store 96 of these vehicles.

"The $25,000 is based on a saving of $833.33 each on 30 trucks as compared with the former horse equipment. It cost the concern 33.7 cents a barrel under the horse system and the company maintained its blacksmith and harness shop and all other equipment which accompanies such a large installment. After figuring all costs of the automobile department for one year, such as tire and battery renewals, current and other maintenance expenses, it was found that 20 trucks were delivering beer at a cost of 24.75 cents a barrel, an actual saving of 8.95 cents, as compared with the horse drawn equipment. This saving is not claimed where one machine is in service but of 20. In very hilly districts, or where the streets are in poor condition, this undoubtedly would be lowered and the expense of horse drawn vehicles also increased. But even if cut in half the economy effected would still be nearly five cents a barrel."



Fleet of Baker Electrics Recently Delivered to the Printing Office of the United States Government—The Carrying Capacities Range from 1000 to 5000 Pounds.

★

The transportation of printed matter, the product of the printing office of the United States government at Washington, D. C., is by commercial automobiles and in the accompanying illustration is shown a fleet of electrics recently delivered by the Baker Motor Vehicle Company, Cleveland, O. These machines consist of two delivery wagons, two light, and a like number of heavy trucks, with a carrying capacity ranging from 1000 to 5000 pounds.

The smallest machine is propelled by a motor, which is series wound, hung on a tubular bar across the frame in front of the rear axle, and current is furnished by a 42-cell Exide battery of 84 volts and 24 amperes. A continuous torque type of controller affords five speeds forward and three reverse. Final drive is by double side

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chain and one set of expanding brakes is fitted and these act on the rear wheels, which are 34 by three inches fitted with solid tires. The steering wheel is at the left. Semi-elliptic springs are employed both front and rear.

The one-ton vehicle is equipped with an 84-volt 28-ampere battery, and has a wheelbase of 92 inches, and 34 by 3.5-inch tires. The larger automobile has an 84-volt, 42-ampere battery with a 120-inch wheelbase, and 36 by 2.5-inch solid tires are employed. The other chassis details of these cars are the same as those of the smaller vehicle.

★

The Kentucky Wagon Manufacturing Company, successor to the Electric Vehicle Company of Louisville, Ky., is constructing and marketing a large number of 600 and 1000-pound capacity electric delivery wagons and in the illustration herewith is presented one of the former type. It is propelled by a 30-cell lead battery and the mileage is estimated at from 40 to 50 with a maximum speed of 12 to 15 miles an hour fully loaded. The complete specifications and descriptions of this vehicle will be found elsewhere.

★

A remarkable mileage on one charge of electricity is credited to a Fritchle automobile which covered 110.9 miles recently. The car carried four persons and was run on the third speed nearly the whole distance. It was operated by M. Francis Eagan of Flatbush, Long Island, N. Y., who started the machine at Prospect Park, and the course was on the boulevard to the ocean front and return, each lap being about 11 miles.

The battery is a 32-cell Fritchle and the machine is made by the Fritchle Automobile & Battery Company of Denver, Col. A knife switch controller is utilized providing five speeds forward and three reverse, and the drive is optional, being either shaft or chain. The motor is compound, hanging from the body, and the maximum speed is rated at 22 miles an hour.

★

That the electric vehicle is capable of longevity and of rendering efficient service is demonstrated by a report of the General Vehicle Company, Long Island City, N. Y., which states that one of its machines has been in continuous service with the American Tool Company of Boston since January, 1906. During the first two months the vehicle met with an accident strictly outside of the running of the automobile, which laid it up two days. It was again placed in commission and has been doing its full quota of work every working day since, summer and winter, covering a period of over five years during which time it was not even painted. July last it was overhauled and painted and again placed in service. This is a remarkable record for a commercial vehicle.

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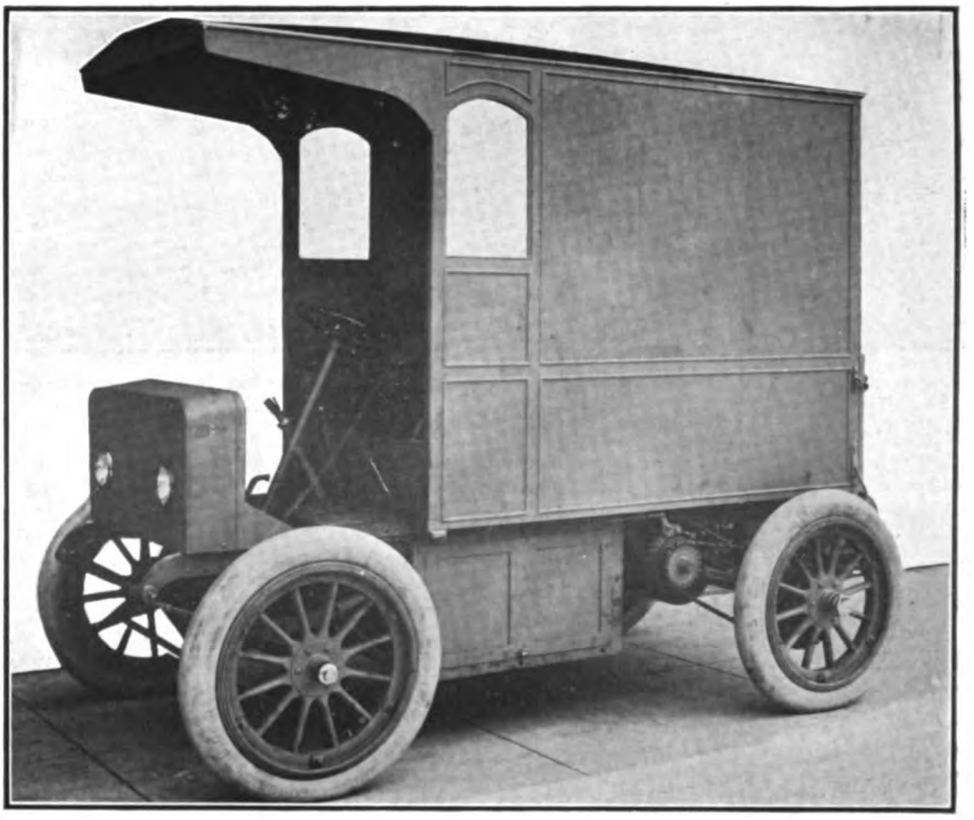
A striking example of the efficiency of the electric motor as utilized in pleasure and commercial vehicles is noted at the factory of the Waverley Company, Indianapolis, Ind., where one is employed to drive an oil pump which forces lubricant through different machines into a filter and back again. The motor was discovered in the junk pile by the engineer and had been used in a vehicle for some time. It was tested out and found to be in good order and placed on a foundation about four feet wide beneath the floor of the engine room. It is covered by a board flooring and surrounded by steam pipes, and although the temperature is never less than 100 degrees Fahrenheit, the motor has never been stopped for repairs. The only attention it receives is oiling once a week.

★

The practicability of the electrically propelled fire apparatus has been exemplified by an aerial truck which has been in service at Springfield, Mass., for a period extending over a year during which time but $3 has been spent for repairs, these consisting of a broken battery jar. The apparatus was inspected recently by an expert from New York City who instructed the department's drivers when the machine was first purchased, and who pronounced it in excellent condition.

★

An electric motor passenger service between Springfield and Boston, Mass., is being discussed and it is thought that during the summer months it would appeal to those travelling between the cities. The practicability of the plan is based upon the recent performance of two electric automobiles on a trip between New York City and Boston. The machines started from Boston and reached Worcester, a distance of 44 miles, in 1:59:00. The road between Worcester and Springfield is 54 miles with many long hills, but the electrics maintained an average speed of 21.2 miles an hour. After recharging, the vehicles ran to New Haven, Conn., a distance of 62 miles in 3:12:00, and were again recharged. The next day the automobiles ran to New York City, completing 244.8 miles in 12:24:00 actual running time and at an average of 20 miles an hour.



Electric Delivery Wagon of 600 Pounds Capacity Built by the Kentucky Wagon Manufacturing Company.

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The Baker Motor Vehicle Company, Cleveland, O., is issuing a series of loose leaf binders giving valuable information upon the application of the electric vehicle in various commercial fields. A recent issue contained the following paragraph: "In investigating the actual cost of draft animal transportation, pains should be taken to ascertain that the accounts produced really represent the necessary expenses of service, and have not been padded by accident, the drift of tradition, or by arbitrary dissections for the convenience or economy of the auditor. A mistake would be unduly exaggerating the advantages of the machine over the horse drawn equipment."

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PIERCE-ARROW TRUCK ADAPTED TO FARM SERVICE.

THE utility of the power wagon in agriculture has been exploited very much in theory and it has been held that its value to the farmer is its superior speed and carrying capacity, best to be employed in the transportation of crops to market or place of shipment, and in conveying supplies. This theory is not to be denied and while this advantage as compared with animal wagons and carts is a sufficient justification for purchasing, it has been found by practical experience that a truck can be utilized for many purposes for which horses have been regarded as having their greatest usefulness.



Pierce-Arrow 66 Horsepower Touring Car Utilized for Emergency Service on Farms Near Geneva, N. Y.

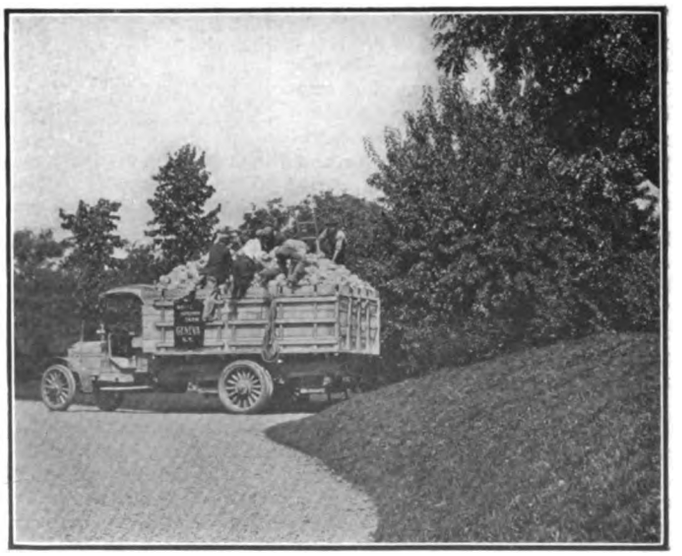
It is not visionary to assume that in a comparatively brief time much of the cultivation of crops of large proportions will be by motor driven machinery. It is not seemingly practicable, however, to have diversified harvests and have special equipment for each that will require the investment of material capital. The special value of the horse in farming has been its adaptability to service where special ways do not exist, particularly in rough ground, although it has been realized that such work must necessarily be more expensive than were it haulage on roads.

The power wagon as now developed is of such construction and its power is so well utilized that it will serve any transportation purpose for which animals can be used, with entire certainty and much less expense. One of the qualities that ought to commend a motor wagon is that it has practically no expense attached to it when not in use aside from the insurance and the interest on the investment, a very large saving when it is understood farm horses are not used a considerable part of the time and rapidly eat the profits made by them while working. Were it possible to find service for the horses for all the time farming would unquestionably be more productive, yet no farmer can hire animals as he does labor, increasing or lessening his facilities at will and with a view of economizing.

It is necessary to invest capital in horses and in this respect the condition is paralleled when a power wagon is acquired, but the reduction of the expense of the unproductive period is so pronounced that there is a distinct saving even when the service appears to be comparatively small, not considering the large reserve of continued operation, for in farming service appearance is not so important a factor as in urban haulage, and theoretically and practically the vehicle ought to be useful for a considerable number of years. In other words, the truck ought to have a life by mileage and this might be made in a comparatively short time or extended over a number of years.

A very interesting experience is that of Alfred G. Lewis, whose estate, the White Springs Farm, is near Geneva, N. Y., and Mrs. George H. Lewis, whose Bellwood Farm adjoins that of Mr. Lewis. The former property is of 700 acres and the latter 350 acres, and while they are cultivated separately the owners have joint ownership of a Pierce-Arrow worm drive five-ton truck. The farms are well managed and a considerable part of either is cultivated, though sheep and cattle are largely raised and dairy products form a material share of the total. The farms are conducted to system and this requires a record of work and results as well as financial transactions. In the use of the truck it is necessary to divide its work and the cost of operation, maintenance, upkeep, repair and other expense is similarly apportioned, the tonnage being represented by a ledger account. It is not practical to have the machine do equal work for either owner and this results in a tonnage basis for accounting its service.

Mr. Lewis is an automobilist and it was the experience with a pleasure motor car that led to the adoption of the truck. The farms have horse equipment and last summer when harvesting peas from an 80-acre tract it required all the horses available to haul the vines from the field to where the peas were shelled for delivery to a canning factory at Geneva. The peas are sold shelled and after shelling it is necessary to deliver them as quickly as possible at the cannery. The custom at this farm is to carry the peas in baskets which when filled weigh 60 pounds. The need of harvesting depends upon the maturity of the peas and once the work is begun it must be hastened. Delivery after shelling is even more imperative than harvesting.



Loading Pierce-Arrow Truck with Cabbages at the White Spring Farm.

The lack of horses impelled Mr. Lewis to adapt his 66 horsepower Pierce-Arrow touring car for temporary work,

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which was done by removing the body and installing a rack in which could be packed 52 baskets of peas. For 15 days the touring car was utilized to carry the crop to the cannery and when the service was accounted it was found



Five-Ton Pierce-Arrow Truck Loaded with Cabbages Ready for Trip from Farm to Market.

that the cost of haulage was decidedly reduced as compared with the use of animals. So satisfactory was the result that after consideration of the possibilities for use on the farms the five-ton truck was ordered.

The truck was delivered to the farm Sept. 1 and since that time it has been in active service with a satisfaction that has been broadened as experience has been gained. In using the machine a driver was assigned who had no knowledge of driving and it was necessary to teach him to handle it. This condition gave less actual productiveness than has been experienced since he became accustomed to his work, for the truck was not loaded to capacity until the driver was thoroughly competent.

The truck was not delivered until practically the end of the farming season which is from April to September. While all the possibilities with the machine have not been developed what has been accomplished has demonstrated that there are many uses not believed practical for power vehicles where its worth has been established.

During the three months ending Dec. 1 the truck hauled 1,316,620 pounds of freight, or 658+ tons with a mileage of 1538. The fuel burned was 376 gallons of gasoline and the cost for this was $45.12. The oil and grease used cost $6. The actual expense for operation of the machine during the period was as follows:

Driver and pay of men handling freight	$225.00
Gasoline	45.12
Oil and grease	6.00
Depreciation at 5%	40.00
Insurance	24.00
Interest at 6%	48.00
	$388.12

The average has been four miles for each gallon of gasoline consumed. The figures do not indicate the actual cost for work now performed as the expense indicated has been considerably decreased. While the depreciation is not figured high the reason is that its service is regarded as mileage, which it is expected to realize with intelligent use.

The service required of the truck is especially varied and it would appear that its uses were collectively of unusual interest. The loads have included lumber, brick, cement, sand and gravel, cherries, applies, cabbages, potatoes, wheat, cord wood, coal, bailed shavings, hay, straw, feed, milk, and sheep and cattle, in general work between the farms and the city, and about the adjacent section. In addition to this the truck has been used in plowing with extremely satisfactory results, hauling harrows over plowed land, for filling silos and cutting corn stalks as well as hauling fertilizers about the farms. The work has been widely varied and in every respect the machine has been equal to expectations.

In considering the work it is held that the truck has been equal to at least three teams of two horses for whatever purposes it has been used, has hauled freight faster and saved time when time was valuable, and has made it possible to do the farm work better and more easily. On the road between the farm and Geneva the truck has been equal to five teams of two horses and an equal number of wagons, the driver and his helper doing the work of five men. Taking the average on and off the farm Mr. Lewis estimates that the truck is more than equal in its service to three two-horse teams. In comment concerning the truck and its work, Mr. Lewis states that on these farms the truck has certainly come to stay. His conclusions, after practical experience with animals and power wagons, are worthy of careful consideration. His farm is conducted and managed as is any successful enterprise. He has decided that it good business judgment to utilize the truck for it permits of savings through economy of time, a source of profit that is always productive.

A 10-ton automobile recently has been placed in service by the Boston & Maine railroad for use of the engineering corps. The car is making a trip over the lines of the company on a regular train schedule, the driver signing the



Pierce-Arrow Truck Starting from the Farm for Geneva, N. Y., with Load of Produce.

train sheet the same as conductors. Many of these cars are in use on the western railroads, where they have demonstrated their ability to make long, quick runs at small cost.

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GENERAL ELECTRIC BATTERY TRUCK CRANE.

IN THIS age of enterprise distance has been annihilated and the products of the soil and of the industrial plants are often shipped many miles to market. The expeditious and economical transportation from producer to consumer requires not only that trains and ships maintain a fast schedule, but that no avoidable delays be encountered at any point. The large quantities of freight that pass through the central distributing and shipping points can be handled so as to eliminate delay only through the utilization of very efficient devices. Marvellous reductions in the time consumed in handling free flowing bulk freight have been made during the past few years, through the use of the belt conveyer, elevator, grab bucket, ore bridge, etc.

In the matter of package freight, the motor truck has demonstrated great superiority over the horse drawn vehicle. Where a fleet of commercial motor wagons is maintained to transport heavy packages to storehouses, shipping points, or other places, expedition in loading and unloading becomes imperative. Various methods for accomplishing this are now employed, and among these may be mentioned the battery truck crane. This enjoys three notable advantages, in that it always is set up ready for instant use, can ordinary intelligence can become fairly proficient in its operation in a day and expert in a few weeks.

Where the material to be loaded is in parcels of one ton or less and is in a pile where the truck can be brought alongside, the battery crane is placed in an advantageous position, the brakes set, and the vehicle remains stationary as the boom moves back and forth between the picking up and depositing points. Some idea of the rapidity with which this device works may be gained from the following performances:

Three hundred castings aggregating 65,000 pounds were unloaded from a gondola car in five hours, giving an average of 1.2 lifts a minute. A box car was loaded with 64 800-pound barrels of plumbago in 25 minutes and four cars in 2.5 hours, the latter work including spotting the cars. This averages two barrels a minute hoisted nearly five feet and swung well inside the car.

The short wheelbase permits short turns, so this machine readily may be driven about shop aisles, congested piers, among piles of material in the storage yard, and may even be carried up elevators to get goods which are to be loaded on motor trucks. By this pick-up-and-run meth-



General Electric Company's Battery Truck Crane Loading Truck with Material Collected from Various Points.

move quickly from place to place, and carries its power plant with it as a permanent part of its equipment.

An accompanying illustration presents the crane recently brought out by the General Electric Company, Schenectady, N. Y. This device is an electric vehicle which has a crane arranged to swing in an arc of 180 degrees mounted on the front end. The hook is raised and lowered by a one-ton hoist, located immediately behind the crane, and the motors driving this and the vehicle are operated from a storage battery, so situated at the rear end as to act as a counterweight. Special attachments are fitted to suit the character of the work contemplated, these consisting of rope and chain slings, barrel tongs, bale grapples, box hooks, snatch blocks, small tools, etc.

The electric hoist comprises a compact weather proof motor, a controller, gears, and a drum combined in a unit, capable of lifting one ton, 20 feet a minute. The hoist controller handle is connected to a lever convenient to operator, who pulls to raise, pushes to lower, and lets go to stop the load at any point, the lever going to the "off" position in the latter instance and holding brakes automatically locking the drum. A load brake also is provided to prevent excessive speeds when lowering. The simplicity of the operating mechanism is held to eliminate the need for technically trained men, it being claimed that a man of od, in which the material is carried on the hook, 60 800-pound barrels of plumbago were moved 300 feet in one hour, only one helper being required. One hundred and fifty 300-pound boxes of rubber were conveyed 75 feet and loaded into a box car in 50 minutes, three boxes being slung together and a round trip made every minute.

The crane can be coupled to trailers and accompany the fleet of trucks for the purpose of unloading them when the material is being conveyed to some central point. It also serves as a general utility vehicle, quickly replacing spilled loads, pulling the trucks out of the mud, and transferring packages from disabled apparatus where delays would occur otherwise.

FEDERAL TRUCK USES GOODYEARS.

The Federal motor truck, made by the Federal Motor Truck Company, Detroit, which won the cup in the recent Chicago-Detroit reliability contest and has been demonstrating in that vicinity since, with the exception of the time it was employed as a baggage car on the Glidden tour, is shod with Goodyear tires, made by the Goodyear Tire & Rubber Company, Akron, O. Despite the poor roads encountered on its southern trip, the vehicle went through without the loss of a moment's time through tire trouble.

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SIX YEARS IN DEPARTMENT STORE SERVICE.

Figures Presented by British Installation of 56 Motor Vans Indicates Enormous Saving Over Utilization of Horses with Increased Business Development of 100 Per Cent.

By C. A. French.

WHILE many department stores in the larger cities of this country have installed extensive fleets of mechanical transports, it is rare indeed that any is found which has been in service for a period of several years. For this reason, it undoubtedly will prove of interest to consider the work performed by a foreign installation, which covers a little more than six years. The figures presented herewith were compiled by Leycester Barwell, one of the partners in the firm of Shoolbred & Co., London, Eng., which began replacing its horse equipment with Lacre trucks, made by the Lacre Motor Car Company, Ltd., Letchworth, Eng., in October, 1905.

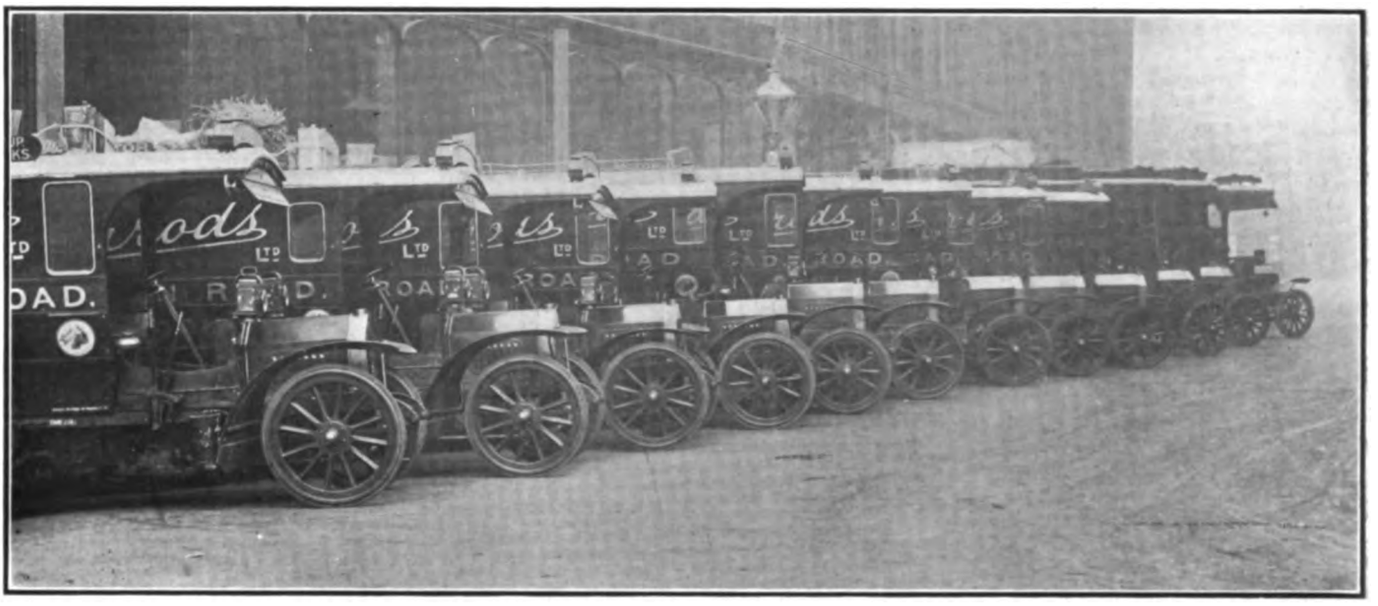
In order to become familiar with the construction of these cars it will be necessary to consider their details, information for which has been furnished by one of the officials of the Lacre Motor Car Company. He writes as follows:

"Our chassis comprise a range of models having a net carrying capacity of 10 cwts. to five tons, 12 to 50 horsepower, and two and four-cylinder motors. (It is well to remember in this connection that an English cwt. is 112 pounds.) In their design simplicity has been studied especially with a view to the vehicles being handled by unskilled drivers. No startling innovations have been embodied; the chassis are designed on proved lines throughout. With our special experience and facilities the production of entirely new designs, as these are for the latest type Lacres, has enabled us to include in our vehicles only the latest and most approved practise.

"We claim that we have embodied all that is best in the designs of other manufacturers, combined with features which are unique. The large number of repeat orders with which we have been favored, we think is sufficient proof our machines are considered most desirable by those best fitted to judge.

"We have made a very special feature of the ease of repair, recognizing that a great deal of time is lost in overhauling vehicles, when by methods such as we have adopted, one unit which requires repair may be substituted by another, and the cars can thus be kept on the road while defective parts are being remedied. For example: The entire motor unit mounted on a sub-frame can be detached from the main frame easily and quickly, and a complete spare engine substituted, so that the necessary work may be accomplished without keeping the vehicle off the road for any appreciable time. For a fleet of cars we recommend keeping as stock, one complete spare unit, and thus overhauls to the motor can be going on at the time most convenient to the user, without interfering in any way with the service.

"We ourselves have designed our engines throughout, and they have cylinders cast in pairs. The 12 horsepower two-cylinder and the 30 horsepower four-cylinder have a bore of 4.33 inches and stroke of five inches. The 18 and 35 horsepower motors have bore of 4.875 and stroke of five inches. Revolutions are limited to a maximum by a heavy type centrifugal governor situated in the crankcase. The lower portion of this case is merely a sump for oil, and contains a patent oil pump, the whole being removable without disturbing the main bearing of the engine, and this latter may be attended to without removing the motor from the chassis if deemed advisable.



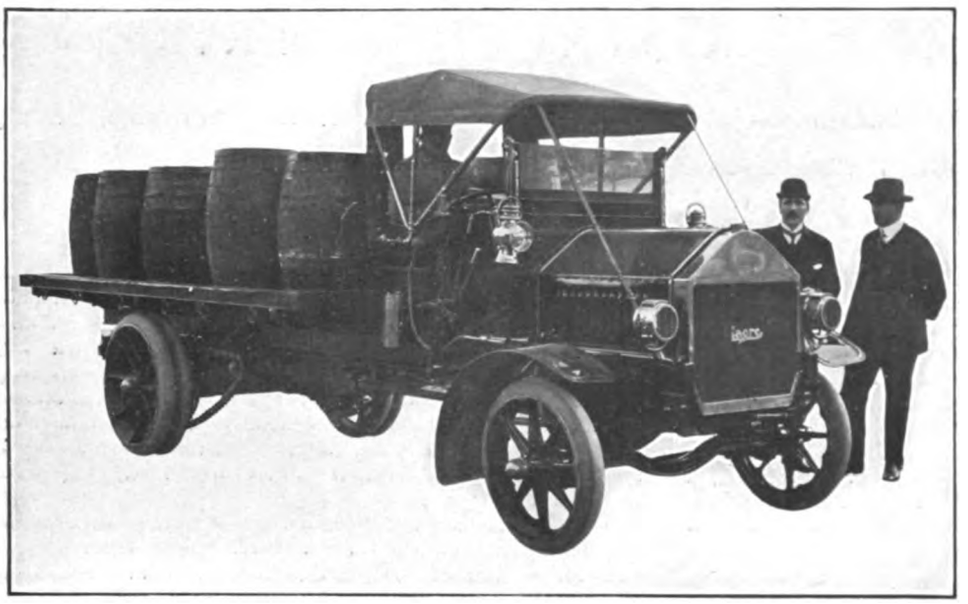
Shoolbred & Co., London, England, Have Been Operating a Fleet of These Lacre Vehicles for Over Six Years with Splendid Success.

"The lubrication is forced to the main engine bearings and connecting rod big ends, and a simple and effective telltale fitted on the dashboard shows that the lubricator is performing its work satisfactorily. The patent oil pump is valveless and barring breakage, it is impossible for it to fail. It is driven direct from the exhaust camshaft, and requires no adjustment of any kind. The crankshaft is of special high grade steel, and the camshafts and wristpins are case hardened; the camshafts and cams are cut from the solid.

"The inlet and exhaust valves are located on opposite sides of the engine and are mechanically operated. They are interchangeable in all sizes. The valves are made of nickel steel and are of specially large dimensions.

"The ignition which we have adopted is fixed Bosch high-tension magneto. An advance can be arranged for it if required, but we do not recommend it. Provision is made

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Platform Type Lacre Truck, Large Orders for Which Have Been Filled in Australia.

on the engine for fitting a duplicate magneto, this comprising magneto, cables, plugs, etc. We particularly recommend this for export purposes. We can fit, if desired, a high-tension coil, storage batteries and plugs as an alternative, or additional, to the spare magneto, but we recommend the fitting of the latter.

"Cooling of the engine is effected by a large centrifugal pump driven direct, and a radiator of large capacity. The water is circulated through vertical gilled tubes, and the fan situated behind the radiator is belt driven; the tension of the fan belt is adjusted easily.

"The simple clutch is leather faced, conical, engaging with the flywheel. The drive to the gearbox is transmitted through a special form of enclosed spring drive, which is particularly efficient. The gearbox is provided with four speeds forward and reverse in the three, four and five-ton sizes; three speeds forward and reverse in the lighter vehicles. All speeds engage by means of dog clutches, except the first and reverse. The change speed mechanism is of the gate type.

"Final transmission from the gearbox is through the differential gear contained in the box which is a part of the same casting, and thence by cross shafts and side chains to the rear hubs. The differential mechanism on all models includes two crown wheels. This is an expensive feature.

"Special attention has been given to the efficiency of the brakes, those worked by foot operating on a single drum fitted on the substantial extension of the differential shaft, and those by hand being internal expanding forms operating on the rear hubs. The shoes have detachable cast iron slippers which can be removed readily and renewed cheaply, when worn. The hand brakes are compensated, of course, and both have very accessible hand adjusting screws.

"All chassis are constructed with a particularly large wheel lock. This is a very special feature of our vehicles, and they can be turned in a remarkably small circle. All models are well protected from mud by a metal shield suspended under the chassis and readily detachable."

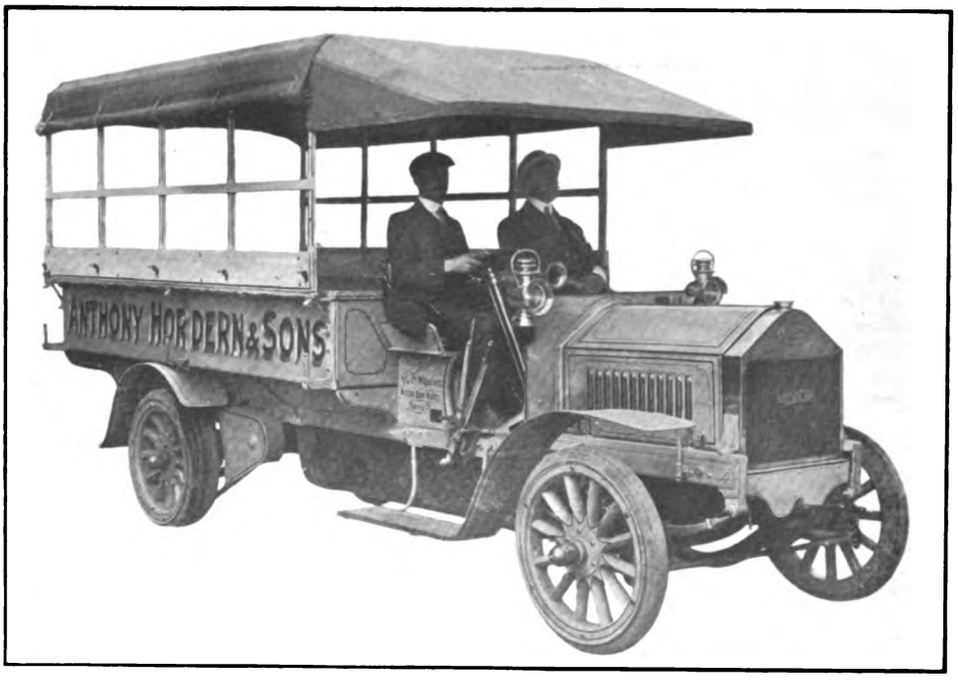
The Lacre chassis are fitted with a variety of bodies, as indicated in a measure by the illustrations herewith. An order for 10 five-ton platform trucks, similar to that shown, followed a single trial in Sydney, Australia, and four of the 30 horsepower two-ton hinged sided wagons have been shipped to the Bangkok Corporation in Siam. Numerous repeat orders are recorded both at home and abroad.

The Shoolbred installation is now one of the largest fleets of motor transports operated by a single firm in Great Britain, and the knowledge of commercial motor traction gained from it undoubtedly is the best that can be obtained. Two cars were purchased in 1905 and the present equipment totals 56, all of the Lacre make. Most of these are of the 10-cwt. capacity, although the eight purchased this year were of the 18 horsepower 25-cwt. type. In a letter to the writer, Mr. Barwell says:

"We have 56 motor vans on the road at present, all supplied by the Lacre Motor Car Company. The first two were put on the road Oct. 2 and 9, 1905, and have done more than six years' work. We estimate that each of these two vans has covered 100,000 miles on the road. From their present condition, they should run at least another 50,000 miles, and we may count on a life of eight years a van in estimating depreciation. When the time comes to scrap the old models, they will be replaced by latest type Lacres from the Letchworth factory.

"By the aid of mileage recorders we find that each van runs about 18,000 miles a year, making an average of 63 miles a day on the road. Some vans do much less, but many do more, a few rounds running into 25,000 miles a year. Our longest regular service is to Hindhead and Haslemere three days a week. This route averages 120 miles a day.

"It is interesting to see how such a service as this grows. We started by delivering a vanload to a certain house some miles south of Haslemere, whenever the order was large enough to enable us to do it by road. We then



Collapsible Top Vehicle Produced by Lacre Motor Car Company, Sold in Increasing Numbers.

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arranged a monthly service to this one house. By degrees a few others came to know this, and the service became fortnightly, then weekly, until finding that the weekly service often meant sending two vans on one day, we made it three days a week as at present. In the same way our service to Hitchin, Letchworth, Baldock, etc., began monthly, and also is now three days a week.

"Before we started motor vans we had 300 horses in our stables, and at present we have 120, mostly for heavy work. Each van does the work of at least six horses on an average, and many rounds would take quite eight horses; that is, supposing it were possible to use animals at all. This cannot be done, however, as vans do not start until fresh supplies are in from Covent Garden Market, and the fish market, and the day would not be long enough to deliver fresh fruit, vegetables, fish, etc., in time to be of use. By means of these 56 vans, we have doubled our road mileage a year, as we have added many new rounds that could not be undertaken with horses. On the supposition that all our present routes could be covered with horses and give satisfaction, we estimate that we would require from 500 to 600 horses in our stables.

"But if we had 300 horses six years ago and now do the work of from 500 to 600, and in the meantime have doubled our road mileage a year, what about the extra expense? Taking the average of the last six years we have

Average Cost of Tires.

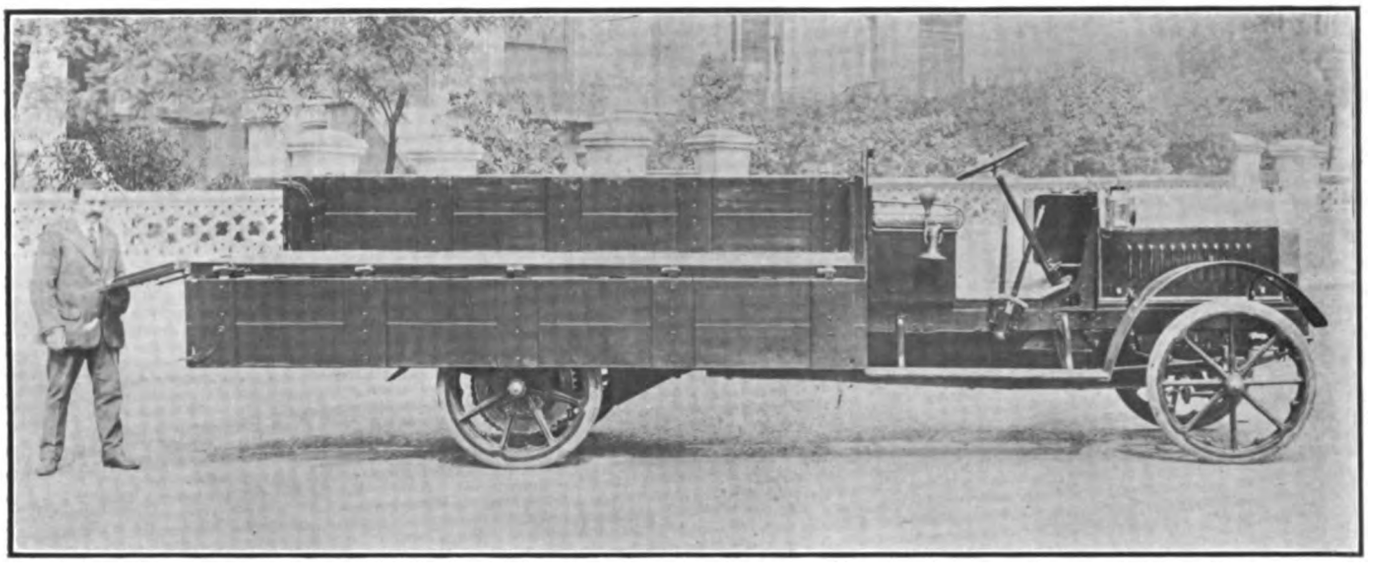
48 vans, first year	$173.12
41 vans, second year	226.08
31 vans, third year	213.37
20 vans, fourth year	251.97
6 vans, fifth year	263.80

Average Cost of Repairs.

48 vans, first year	$142.83
41 vans, second year	271.09
31 vans, third year	235.83
20 vans, fourth year	264.57
6 vans, fifth year	239.77

This gives an average expense of $211.07 for tires and $219.30 for repairs on each vehicle. Mr. Barwell disregards the first year's costs as being too favorable, bringing his average to £47 a year for tires and £53 for repairs. His table of costs follows:

Depreciation, 12.5%	$243.32
Repairs	257.92
Tires	228.73
Fuel, 1645 gallons @ 14.2 cents	233.59
Driver @ $7.53 a week	392.24
Oils, grease, carbide, etc.	34.06
Washing	29.20
Insurance, third party only	26.28
Total	$1445.34



One of the Four Two-Ton Hinge Sided Trucks Recently Shipped by the Lacre Motor Car Company to the Bangkok Corporation in Siam.

increased our stable expense £400 ($1948.60) a year, and to offset that we have increased our road mileage no less than 100 per cent.

"In the six years, besides extending all our existing country rounds, we have added 20 districts by the use of 12 additional vans; four vans do a district daily, and eight do one district three days a week and another the other three days. These 12 vans mean 12 drivers at 30s ($7.30) a week and 12 porters (helpers) at 26s ($6.32), or increased wages of £1740 ($8456.40) a year. But as motor vans are so much cheaper to run, the total expenses only average £405 ($1968.36) a year more. Had we put on 12 additional horse vans, each worked by four horses, the expense must have been increased £5000 ($28,300) a year, including the wages of 12 porters.

"Our country rounds, when done with horses, averaged 45 miles a day, and each round took four horses to work, two working and two resting. Allowing 18 days off in the year for repairs to van and absence of horses from lameness, colds, etc., not to mention their deaths, such a round would total about 13,000 miles a year, and at the lowest would cost £350 ($1701) to work. This is at the rate of 6.5d (13 cents) a mile. From the accompanying figures it will be seen that a country round of 18,000 miles a year cost £300 ($1458), which is at the rate of four pence (eight cents) a mile. Porters' wages are not reckoned in either case."

Mr. Barwell's figures have been converted into American money for the better understanding by the reader, and cover one year's service.

He adds: "I have not allowed for interest on capital or garage rent, but I have not taken either item in my horse expenses. All our buildings being freehold, it is difficult to estimate the rent. If the interest come out more for motor vans, the rent certainly would be lower, as one motor van requires much less room than one van and six horses. Engineers' salaries are charged in 'repairs for motor vans.' As I was responsible for the stables for 12 years before we started motor vans, I was not likely to be prejudiced in favor of the new locomotion, and in the figures given, all taken from our books, I have been careful not to favor the motors.

"We have done the whole of our repairs for 4.5 years, and the only men engaged on account of the new traction were mechanics in the repair shop. Not one single man has been engaged as motor driver, and our engineer and his assistant have been with us for several years in our electrical engineering department. Of the last two it is difficult for me to speak except in the superlatives of praise, and I always shall feel in their debt for the keenness they have displayed in making our motor fleet a success."

To return to Mr. Barwell's figures: His depreciation would indicate that each truck costs practically $2000. The

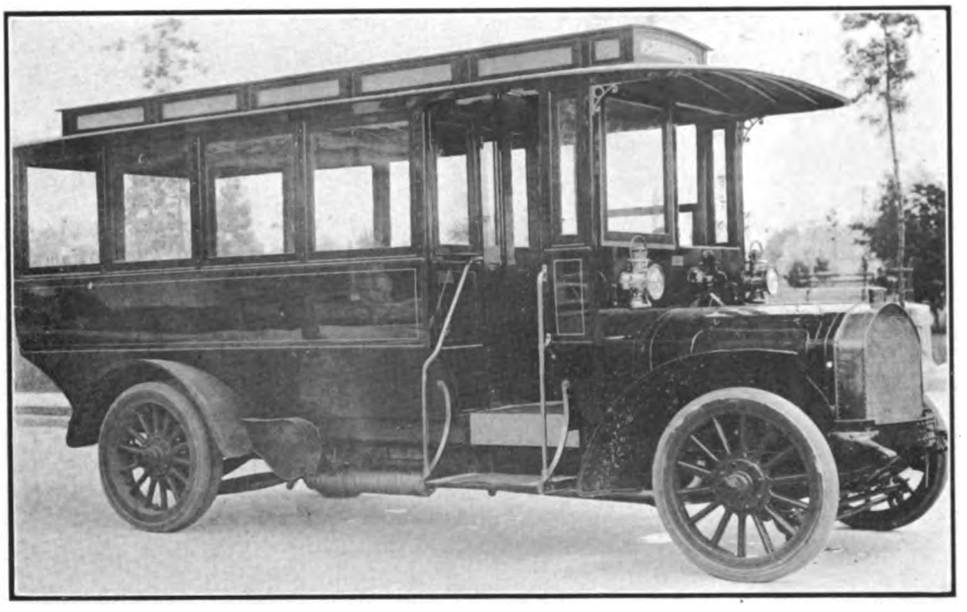
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item of repairs undoubtedly is governed somewhat by the cost of labor, which is decidedly different from in America, as evidenced by the wages paid driver and helper. Just how this same ratio is maintained with respect to mechanics is a point that is not made clear in Mr. Barwell's letter. Tires were solid, and the price probably does not differ greatly from those in use here, judging from the cost of the truck.

Gasoline is measured in England by the imperial gallon, which is equal to 1.20032 gallons in America. That means that the average fuel consumption was 1270 gallons, which could be bought in this country for at least 10 cents, making the cost $127, as against $233.59. The charge for oil, etc., appears to be about the same as would be the case in America.

Mr. Barwell explains that all the company's buildings are "freehold," which means that they are owned outright by the firm, instead of being leased for a term of 999 years as is quite common in that country. Even under similar circumstances it would be customary to charge something for rent in America.

The chief value in Mr. Barwell's figures lies in the statement that the added stable expense has been but $1950 to to secure an increase in business of 100 per cent., while it would have taken an increase of some $19,800, disregarding the wages of the 12 helpers, which were needed in either case, to have accomplished the same result with horses, granting it would have been possible to do the work with animals.



Mack Enclosed Passenger Omnibus Providing Seating Capacity for 18 Persons.

MACK ENCLOSED PASSENGER 'BUS.

Motor propelled omnibuses have been in service abroad for several years and they are now being introduced in this country. Chicago has taken up this form of service which example is being followed by Indianapolis, Ind., and in the accompanying illustration is shown a type of vehicle adapted to this kind of work. The machine is made by the Mack Bros. Motor Car Company, Allentown, Penn., a constituent of the International Motor Company, New York City.

Entrance to the automobile is at the front and the body dimensions with the overhang provide seating capacity for 18 persons. Energy is furnished by a four-cycle, four-cylinder, water-cooled motor of four-inch bore and five-inch stroke, rated at 48 horsepower. Dual ignition is provided and lubrication is by a mechanical force feed oiler, also a splash system in the crankcase. A friction clutch of the cone type transmits power through the gearset which is the selective individual clutch method, to the countershaft and thence to the rear wheels by side chains.

Semi-elliptic springs are utilized in front and full platform in the rear. Solid tires are fitted to the wheels, the front members being 36 by five inches and the rear 36 by 3.5, dual. The wheelbase is 13 feet, two inches and tread 68 inches. The approximate weight is 6800 pounds.

DELIVER WHEELS BY VELIE TRUCK.

Franch & Hecht, Davenport, Ia., maker of steel wheels, has purchased a three-ton Velie truck, made by the Velie Motor Vehicle Company, Moline, Ill. The car is to be tried out on the delivery routes for which between 15 and 25 horses are now employed. If the plan works out as expected all the horse drawn equipment will be replaced with Velie trucks.

LONG PLEASURE TRIP IN REO TRUCK.

Mr. and Mrs. Ralph Barker of Empire, Ore., recently completed a most novel transcontinental trip, utilizing a Reo light delivery wagon, made by the Reo Motor Car Company, Lansing, Mich. The journey occupied 43 days, and when the truck arrived at its new home in Oregon it apparently was in as good condition as when it left Stratham, N. H., where it was purchased.

A few months ago Mr. and Mrs. Barker left their homestead in Empire on a visit to their native town in New England. While there, they purchased the automobile, and decided to return over the road. A touring cover was attached to the vehicle, converting the interior into a regular living room, and the further equipment included a complete camping outfit.

The idea was to provide as much enjoyment as could be gained in a tour of this nature, and Mrs. Barker has informed R. M. Owen & Co., New York City, distributor for Reo cars and trucks, that the trip was one continuous round of pleasure. The route included Chicago, Council Bluffs, Omaha, Cheyenne, Boise, to Burns, Ore., thence over the Prineville-Santiam route through the Willamette valley to Roseburg and across the Coast range to Empire.

The total distance was not far from 7000 miles. Although much rain and muddy roads were encountered in Nebraska, Wyoming, Idaho and Oregon, the party reached home nearly two weeks earlier than it had expected. Not a cent was paid for railroad fare, the entire journey being made in the motor truck.

GARFORDS IN TWENTY CAR LOTS.

That the business world is beginning to realize the many possibilities of the commercial vehicle in transportation service, appears to be borne out by numerous recent sales of cars in large lots. The R & L Company, New York City, reports a contract with James Butler, a grocer who operates a chain of stores in the metropolis, for 20 one-ton Garford cars, made by the Garford Company, Elyria, O.

WATERBURY HAS CORBIN AMBULANCE.

The Waterbury Hospital in Waterbury, Conn., has purchased a motor ambulance made by the Corbin Motor Vehicle Corporation, New Britain, Conn., and thus becomes one of the few hospitals in that state to be thus equipped. The new machine will have two compartments so that several patients may be carried at the same time.

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HAULING AND DISTRIBUTING ICE BY POWER WAGON.

Economy and Reserve Facilities Experienced with Truck and Delivery Supplementing Animal Service Under Conditions Extremely Variable---Results Decidedly Satisfactory in Outside Work---Great Saving When Vehicles Are Not Active.

By William W. Scott.

THE haulage and distribution of ice, either by animal or motor power, is varied greatly by changes of temperature and by seasons. Obviously at two periods of the year there are large and exacting demands for the use of animals. With power wagons the winter requirements do not parallel those made upon horses for it is not possible to utilize them in the harvesting of ice.

In considering this subject with reference to mechanical transports it is well to understand the conditions obtaining that the economic possibilities may be made clear. There is a certain constant volume of the business of an ice dealer, that is, so far as service is required, but this is varied by the weather. There is another proportion that demands attention for periods differing in length, beginning with late winter or early spring and continuing until well into the autumn or early winter.



Peerless Truck of Four Tons Capacity in the Service of the Pocasset Ice Company, Providence, R. I., Equipped with Special Body.

The ice is harvested as quickly as is possible, although the actual work may be at intervals more or less frequent for several months. In preparation for ice harvesting there is preliminary work done at convenience. Occasionally it is necessary to transport equipment or supplies from the one locality or another, when expedition may be of extreme importance. In the actual cutting of ice the plows are drawn by horses for which work the power wagon cannot be used, though it might be made a substitute for animals used for hoisting. Quite frequently the places of harvesting are long distance apart and if conditions necessitate the work being done simultaneously the total number of animals required might for a brief time be practically all that are owned by the ice cutter. As quick action is advisable when a harvest is begun a dealer must have facilities that are at his command when needed. For harvesting some horses must be used unless means are materially changed.

The distribution continued through the winter months is increased as the weather becomes warmer until it is at its height during the summer, and then there is gradual diminution of volume until it is lowest with the coldest temperatures. Ice is a perishable commodity. It is estimated that the shrinkage, a loss borne entirely by the dealer, from time of cutting to delivery, will average 50 per cent. Of this approximately 33 per cent. is in the ice house and the remainder is breakage and meltage. When exposed to the air the loss is very rapid and the warmer the atmosphere the greater the shrinkage. Rapidity in handling is a decided economy but the character of the loads have necessitated heavy carts and the slowest of haulage. Loading and unloading cannot be greatly expedited, and as there is but little difference in speed of draft animals when hauling loaded or empty carts endeavor has been toward minimizing the service of the delivery wagons by carrying to them whatever replenishments were necessary, so that delivery may be made with the least actual loss of time by the drivers and helpers. This applies to the usual house to house delivery, or retail trade.

The wholesale delivery is in quantities from several cakes to several tons, and obviously the number of calls for a team is much smaller. The haulage is not as long as a rule and the direct loss by shrinkage is less than with the the family service. Often in some localities the available ice supply is exhausted and this necessitates buying ice or shipping it from another place. The ice is hauled in cars and it must necessarily be handled quickly to minimize shrinkage. Generally ice so received would be delivered from the car.

It will be seen that the distribution of ice may require many stops close together (taking much time to cover a short distance), frequent stops in different sections of a community, stops at varying distances apart, or, with the wholesale branch, delivery by the load or in quantities requiring a few calls, such distribution generally being scat-

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tered. Of course it is impossible to concentrate delivery, but it is often necessary to confine it to sections where the number of customers make it profitable to call.

With rare exceptions all ice dealers of importance believe it necessary to maintain an equipment sufficiently large to meet with the greatest demand upon them. To insure continuance of custom it is desirable to serve all reasonable demands, and excess patronage must be cared for so far as possible. There are limitations to service, however, particularly when extremely warm weather will double, triple and sometimes quadruple the delivery service. When other business men feel that it is necessary to reduce the work of their animals the ice dealers often are required to work theirs beyond normal requirements, even at the risk of incapacitating or perhaps permanently reducing their serviceability. There is a limit to the work of the men as well.

The experience of the Pocasset Ice Company, Providence, R. I., the past season with power wagons supplementing its animal service has established the efficiency of the former for a certain work. This is resulting from the use of a Peerless four-ton truck and a Reo 1500-pound wagon. It is not to be assumed that this experiment was undertaken without uncertainty as to results. The extreme heat demanded a service beyond the resources of the concern, and a couple of demonstrations by the Reo agent resulted in an order and the use of the demonstrated wagon until the



Peerless Truck in Contract Outside Service, Plied High with Bundled Laths.

machine ordered had arrived. A demonstration was made for two days with the Peerless truck, which was purchased upon condition of immediate delivery, although this deprived the agency of the only truck it had, and it has since been without a demonstrator.

Most large ice companies have central supply stations where ice is received from outside sources, from which the distribution is made by carts which renew supplies at this point. From these stations supplies are also sent to smaller stations in different sections where other series of carts are loaded, this saving the time of the drivers, animals and carts in loading and hauling. These stations are also supplied from the ice houses contiguous to the city or town. Where such stations are not used it is customary to send supply wagons from the ice houses or the freight yards to different localities to meet the peddling carts.

Where a supply wagon is used the driver will go to the vicinity where he ought to meet a peddling cart and hunt until its driver is found. Then the peddling cart is driven to the supply wagon and the ice transferred. The process is repeated until the supply wagon is emptied, when it returns for a fresh load. Naturally in such service saving of time means less loss in the services of the carts, animals, the drivers and the shrinkage of the ice, which is an important factor, for all loss must be borne by the dealer.

In the rapidity of supply service there is decided economy. The loaded carts are sent out as early as delivery can be begun, this varying with reference to family or business trade. According to conditions one, two or even three men may attend each cart. With the wholesale trade at least two men work on a cart because of the labor necessitated in handling the cakes. The carts having regular route work are drawn by a pair of horses and start with loads of about 6000 pounds each. The daily travel is about 18 miles, but Saturdays and holidays the work is increased as approximately 50 per cent. more ice is supplied.

The family delivery is usually solicited by the drivers. In the winter one route may be a combination of the customers remaining from several summer routes, but in the spring the drivers call on former customers and by distributing cards and others means of advertising develop business. The delivery is extended so far as each man can attend to it, and then he is given one and sometimes two helpers, as may be necessary. A route may be extended over a considerable area.

Where the customers are close together the horses become trained and some will work with much intelligence, stopping at customers' houses and starting with the sound of a gate closing or the driver's steps, so that unless there is 100 yards or more to drive the animals often follow along at or without command. In work of this character, where it would be necessary to stop and start a motor to prevent possibility of accident, and where the rapidity of the driver's movement largely governs service, a power wagon would not much expedite delivery, even with a helper to drive it. It would, however, have an advantage in going to and from the locality of delivery.

The Peerless truck was placed in service delivering ice from the ice houses to route wagons and in this work it was found to have a decided advantage. The average trip is estimated at six miles, and eight loads of four tons each were delivered as occasion required, this being about the maximum. The time required for loading depends on conditions at the ice houses and the unloading upon the needs of the carts supplied. The truck replaced three supply wagons, the driver and helper of the truck doing the work of three drivers. In the work required by the company there was and now is considerable variance, because when not actually needed and outside orders were received the truck was often devoted to other work for varying lengths of time. It was not used exclusively for wholesale delivery, but its work was such as to justify the belief that with three men the truck could do as much as four horses and four men. Besides this in the event of emergency orders the truck can be loaded with any quantity of ice within its capacity and hustled along. This enables the acceptance of orders that could not otherwise be taken, and extends the radius of the business.

The active head of the concern, Clinton A. Walch, has owned automobiles for nearly 10 years and this experience has been of material benefit in directing the use of the truck. The driver had no experience until he was set at work under the observation of a demonstrator, and he has been trained to meet Mr. Walch's requirements. He is required to give whatever attention is essential to operation, but when work is beyond his capacity mechanics employed by the company assume it. In operation Mr. Walch insists upon cleanliness of the mechanism and the truck is washed each night. The mechanical attention thus far needed has been practically adjustment instead of repair. The tire wear has been comparatively small. It will be seen that so far as actual expense for maintenance and tire renewal is concerned the truck has not been used a sufficient length of time to give figures of real value.

The truck has a maximum speed of 13 miles an hour, the governor not allowing excess of this no matter what the position of the throttle or ignition levers. When the truck was first bought a broken governor spring reduced the speed to about eight miles an hour, and Mr. Walch decided not to make replacement of the spring until the crew was familiar with the machine. This also brought the gasoline consumption down to approximately three miles to the gallon, which was understood and not objected to. The gasoline consumption is normally about six miles to the gallon and about 100 miles is driven to the gallon of oil.

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Basing estimate on daily service for a variable period is unsatisfactory and to make estimate on both variable service and variable periods would appear to be sheer nonsense, but there are the best of reasons for making conclusions which will appear.

The Pocasset Ice Company ordinarily has in service about 50 horses, which number is increased by purchasing or hiring as occasion may demand. The experience has always been that in the time of year when the delivery was greatest the facilities were never adequate, and yet when the service diminished and there was excess the value of animals trained to the work was such that only those that had ceased to be useful were disposed of. This has meant finding work for the horses, which must be exercised when not working, a problem with which every ice dealer has to deal. It must be apparent that taking the delivery outfit of a business of this character, with the service increasing and diminishing very much, what would be necessary not more than six months of the year must be carried the remainder at no profit, if not at actual loss. This means that all kinds of haulage work is undertaken, casual and regular, and with the time lost there is usually no expectation of anything more than keeping the service intact at minimized expense. This condition has established a price which ranges from $4.50 to $5 a day for the service of a pair of horses, cart and driver for regular service, and naturally something more than this when the work is temporary or for a short period. There are times, however, when service is sought that commands higher prices. With horses the natural limitations of the animals minimizes work that would naturally be the most productive.

With this company it has been found possible to undertake haulage that horses could not do, and these long hauls have often been so arranged that both trips have been productive. This has resulted in the truck being sent for runs of more than 100 miles in a day. One of these was from the garage to Greenville, R. I., where a load of four tons of fancy apples was taken on and carried to a horticultural exhibition at Boston. Another was a delivery for a furniture dealer during which, with a late start and numerous waits, the machine made 70 miles. Another work was carting an apple harvest to a cold storage plant, yet another was hauling lumber, still another hauling grain, and so on, it being impossible to account for this as regular service and compare it with horse work. While this cannot be tabulated for comparison its value is understood and established with the company.

In this connection the work of the Reo power wagon may be emphasized. While it was used for a few days to supply ice to the peddling carts it has been generally sent out with special orders, ranging from a few deliveries for regular customers who had been "skipped" by the drivers or helpers to a single load demanded in an emergency call. It has been particularly useful during periods when all the service was worked to the limit, and has carried as many as 13 full loads varying distances in a day. During the shipment of ice from storage at Oxford, Mass., the wagon was sent over the road from Providence to that town and was there for about two weeks carting ice from the houses to cars, doing the work of two single-horse carts, to say nothing of saving in shrinkage by its superior speed and the fact that one man did the work of two drivers. While the record kept shows the weights carried by this machine in delivery work no mileage or fuel, or lubricant data has been preserved. Here again the broad statement of the company as to the utility of the machine is the best that can be given. This is in effect that the Reo has been all that was expected and has been entirely satisfactory. The speed of this machine has offset its limited capacity for ice delivery.

It is apparent that service must be estimated on comparisons with vehicles of corresponding capacities and that manifestly it is impossible to utilize one type, for instance, with equal satisfaction for every requirement.

Relative to the work of the truck the following data demonstrates what it accomplished in regular service, this covering a period of two weeks and showing the mileage and consumption of gasoline, it being loaded with from 3000 to 8600 pounds of ice:

Date	Mileage	Total	Gasoline Gals.	Total
October 9	40.8			
October 10	20.6		5	
October 11	52		12	
October 12	46		9	
October 13	46		7	
October 14	40		8	
		245.4	—	41
October 16	44.4		8	
October 17	48			
October 18	37		8	
October 19	37		8	
October 20	36.8		7	
October 21	37.9		8	
		241.1	—	39
		486.5		80

This shows an average of 40.5 miles daily and an average of 6.08 miles to the gallon of gasoline consumed. It should be said that this does not represent the maximum of truck service, but what was necessary during the period given.

The truck as a supply delivery has taken the place of three two-horse carts, and its crew of two the place of three drivers. Making comparison of the cost of the truck and horse outfits we find the following:

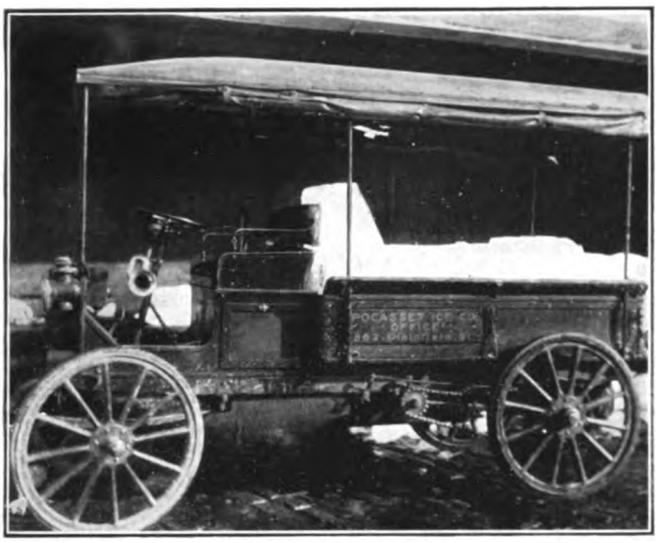
Horse Outfit—			
6 horses at $350 each	$2100.00		
3 carts at $250 each	750.00		
3 sets harness at $75 each	225.00		
Incidentals	100.00		
			$3175.00
Truck Outfit—			
Chassis	$3700.00		
Body	200.00		
Incidentals	100.00		
			$4000.00
Operating Expense, one year—			
Horses:			
Interest, 4%	$ 127.00	$ 127.00	
Depreciation, 10% annually, horses	210.00		
Depreciation, 10% annually, carts	75.00		
Depreciation, 20% annually, harness	45.00		
		$ 330.00	
Care and Maintenance—			
6 horses at $1 a day	$2190.00		
3 carts at 50c a day	547.50		
		$2737.50	
Supplies	$ 100.00	$ 100.00	
Attendance—			
3 drivers at $12 a week each	$1872.00	$1872.00	
			$5166.50
Truck:			
Interest, 4%	$ 160.00		
Depreciation, 20% annually	800.00		
Insurance	180.00		
		$1140.00	
Care and Maintenance—			
Tires	$ 900.00		
Repairs	400.00		
Gasoline	240.00		
Oil	48.00		
Grease	20.00		
Supplies	100.00		
		$1708.00	
Attendance—			
Driver, at $15 a week	$ 780.00		
Helper, at $9 a week	468.00		
		$1248.00	
			$4096.00
Difference in favor of the truck			$1070.50

It will be noted that the truck is depreciated at 20 per cent. annually, and that half the depreciation is allowed for repair, making the cost annually for maintenance $1200. To this should be added the tire expense. The tires are 36 by five inches on the front wheels and 40 by five inches dual on the rear, these being guaranteed for 8000 miles by the maker. The mileage of the truck is estimated at 250 weekly, or 13,000 annually. This would allow a total of 65,000 miles for the period of five years that has been the basis of estimate, and this is nearly 100 per cent. less than is regarded as a reasonable mileage. In fact, this is but a third of the mileage that is placed as the life of a first class machine by European builders.

Should there be mileage in excess of 65,000 this would be clear gain and all in favor of the truck, while it would be against the horse outfit. Of course there should also be considered the reserve possibilities, in which the truck has

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double capacity with an additional crew, and its greater utility during periods of extreme need. The cost would be no greater for any item save fuel, lubricants, tires, repairs, and attendance. Additional horse service could only be ob-



Reo Power Wagon Used for Emergency Delivery by the Pocasset Ice Company.

tained by buying or hiring extra animals at the prevailing market price, and the drivers and animals would not be trained to the work and consequently would not be as productive.

The body equipment of the Peerless truck has been placed at perhaps a less price than might be paid for a similar construction, for this was built by the ice company in its own shop and from selected material to meet its exact requirements. This body is built with a double deck with a sheet of steel between the planking to keep the water from the melting ice dripping on the chassis mechanism, and it is drained at either side of the forward end. The sides may be removed to give a clear platform if desired. No canopy covers the body.

With the Reo power wagon the showing is remarkable because of the utility of the machine and its rapidity of movement. This vehicle is considered the equal of three single-horse carts, and with it one driver can do the work of three drivers of horses. The average mileage for a horse that is worked daily through the year, or the greater part of it, is 18, and this cannot move faster than a very slow trot under the most favorable conditions, such as when the cart is empty. The Reo power wagon has a maximum speed of 15 miles an hour and with a load of 1500 pounds it can be driven conservatively to do the work of a horse in two hours, if conditions favor. A horse could draw more than the wagon has capacity, but the greater speed of the machine more than compensates for this. The consumption of fuel is about a gallon to each 10 miles driven, and the oil consumption is about one gallon to 125 miles. The tires are 36 by two inches forward and 36 by 2.5 inches at the rear, a set costing approximately $75. The tire service varies greatly, because of the tendency to overload all machines, but 5000 miles is not an extreme. Contrasting the work of this class of power wagon and horse outfits the following figures are regarded as not being excessive. It might be said that some machines of this type, used for pleasure vehicles and driven much faster, have mileage of from 50,000 to 60,000 and are still doing good service. Obviously overloading is severe on the tires and this brings the expense of operation above that which might be realized with more attention to consistent loading. In this conclusion it is assumed that three full sets of tires are used annually, even the first year:

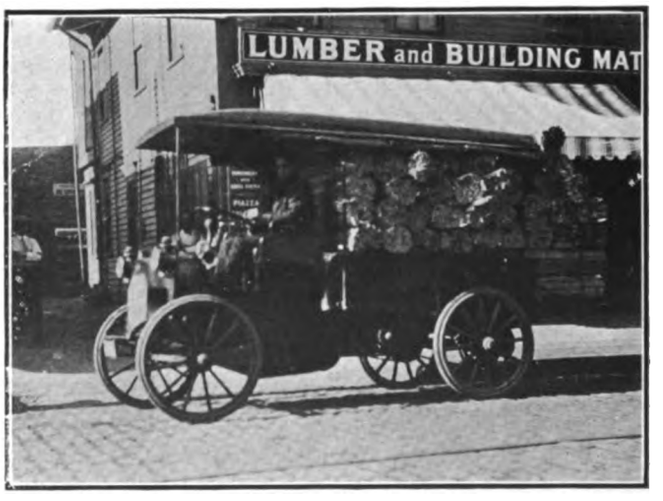
Horse Outfit—		
3 horses at $350 each	$1050.00	
3 carts at $250 each	750.00	
3 sets harness at $40 each	120.00	
Incidentals	25.00	
		$1945.00
Power Wagon Outfit—		
Power wagon complete	$ 650.00	
Incidentals	75.00	
		$ 725.00
Operating Expense, one year—		
Horses:		
Interest, 4%	$ 77.80	
Depreciation, 10% annually, horses	105.00	
Depreciation, 10% annually, carts	75.00	
Depreciation, 20% annually, harness	24.00	
Care and Maintenance—		
3 horses at $1 a day	$ 915.00	
3 carts at 33c a day	305.00	
Supplies	50.00	
	$1551.80	
Attendance—		
3 drivers at $12 a week each	$1872.00	$1872.00
		$3423.80
Power Wagon Outfit—		
Interest, 4%	$ 29.00	
Depreciation, 20% annually	145.00	
Insurance	50.00	$ 224.00
Care and Maintenance—		
Tires	$ 225.00	
Repairs	125.00	
Gasoline	172.00	
Oil	45.00	
Grease	10.00	
Supplies	75.00	
		$ 652.00
Attendance—		
Driver at $15 a week	$ 780.00	$ 780.00
		$1656.00
Difference in favor of power wagon		$1767.80

It will be seen that by this estimate the driver of the power wagon is paid more than the driver of the ice cart. To make this comparison it has been necessary to assume that the same work was performed every working day of the year, a condition manifestly impossible with ice dealers.

To understand the extremely variable character of the ice dealer's trade it may be stated that, assuming the demands of the summer business to be 100 per cent., for five months the volume may be placed at maximum, for four months of the year at 50 per cent. and for the remaining three months from 15 to 20 per cent. And there are periods when with all available facilities it is hardly possible to meet the demands.

With horse service with the shrinkage in business there can be little difference in the maintenance expense. If not worked the animals must be exercised, they must be given the same attention in the stable, and fed slightly less. There might be some saving in the expense of drivers, but this is the only possibility of economy.

With the truck and power wagon the saving is surprisingly large. Place the two in the garage, jack them clear of the floor, grease the exposed metal and wrap the tires



Reo Power Wagon as Loaded for Contract Delivery for a Lumber Firm.

to keep them from the light. The only fixed charges to continue are interest and insurance. It might be consistent to charge off a small percentage for depreciation and for tires, but there could be no other maintenance cost. Stor-

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age must be provided for the machines, which would correspond to stabling for the horses.

The cost of the machines withdrawn from use would be not more than 10 per cent. of the operating expense, making a liberal estimate.

The cost of the animals when unproductive would be at least 80 per cent. of the normal expenditure, for depreciation is constant, it being possible only to make material saving in the reduction of attendance. In this respect there is a difference that is not apparent until analysis is made. Thus whether the power vehicle is working or not the variable character of its maintenance and care charge is an extremely potent factor in its favor. Of course the assumption is that the owner of any form of transport would desire to utilize it as much of the time as is possible, but where the conditions will not permit this the absence of operating expense is a decided advantage.

The Pocasset Ice Company has found it possible to utilize its truck and power wagon by making contract work of different kinds, and while there are limitations to the uses for which they are adapted because of body construction it is a fact that they are better than the carts employed for ice distribution, because such carts can be used for but one purpose, and to do contract transportation necessitates owning or hiring other forms of carts and wagons suited for such service.

SPEEDWELL COMPANY'S CAMPAIGN OF EDUCATION.

WORKING as a special representative of the Speedwell Motor Car Company, Dayton, O., H. Harry Croninger is travelling over the entire South on an educational mission, endeavoring to show the merchants and manufacturers of that region the exceptional advantages to be gained through motor vehicle delivery. His position is made clear in the following interview granted an Atlanta paper:

"First of all, let me impress the fact that I am not a salesman, nor do I wish to sell anyone a truck. My work in the South is purely educational. I want to investigate the situation and if possible interest the business men in the advantages accruing to them by the adoption of the commercial motor car for their delivery needs. It may be our truck; we hope it will be, but I am trying to show by arguments and figures the financial saving to be derived, whether it be the Speedwell or some other good machine.

"We are living in an age of progression; an age where modern methods of business are essential, and in every line of endeavor we discard the old and inadequate forms for the more recent ones that show a marked improvement—a bettering of production and service, and financial saving. The commercial motor car is one of the modern inventions that does show these things, and in the course of time it will entirely displace the horse and mule for delivery purposes, just as surely as the steam railway has taken the place of the old stage coach.

"The purchase of trucks by the large operating companies is made after a thorough investigation. They acquire this information from every state, and the accompanying compilation of operating costs is made up from records furnished us by owners. Unfortunately we cannot secure equal data regarding the cost of operating horses and wagons. Careful search and investigation have been made extending over a long period, but we fail to find any operating company or even individual that really knows what the cost a ton a mile is by means of horses. We therefore can only quote what many of the express companies and large merchants say—that a six-ton motor truck will make the same trip in about one-half the time of horses, and that four trucks with four drivers will displace eight drivers and 48 horses.

"Of course, economy depends entirely upon ton-miles, and unless the merchant has a tonnage he cannot effect economy. His advantage is then one of service and quick response to customers. It is recognized that the merchant who has at his command a means of instant service or delivery is the one who will get the business.

"The tenacity with which some business men cling to an old method of transportation is astonishing. Commercial conditions have demanded commercial trucks. A busy man would not consider taking a local train from New York to Chicago. He demands service and quickness, so he takes an 18-hour train. A few years ago we were content and considered it remarkable to cross the Atlantic in seven days. Commercial conditions and commercial men have forced better service, and today we find it of five and even less days.

"The motor truck comes under the same category, and the merchants and operating companies have forced the manufacturers to produce a means of rapid, dependable and economical transportation of merchandise, and are wondering how they ever got along without it.

"By the estimate herewith is shown clearly the economical point. It will be noted that I give $600 a year for upkeep, but with careful driving and a good service department a merchant can cut this down to $200 a year. This is a saving a ton-mile. He can cut his depreciation from 20 per cent. to 12. This is a possible saving a ton-mile. I figure $20 a month for garage expenses. If he use three trucks and has an equal space for six horses, this can be cut to $10 a month. This is a saving a ton-mile, but it is my idea to give a good, liberal estimate.

"We find that the cost of operating by horse and wagon is 36 cents a ton-mile. The following is the cost of operating a four-ton truck, based on 40 miles a day of 10 hours; six days a week; 304 a year; speed, 12 miles an hour; gasoline, 5.5 miles a gallon:

	A Mile
Gasoline, 11 cents a gallon	$0.020
Oil, etc., 30 cents a gallon	0.001
Repairs and replacements, including labor ($600 a year)	0.049
Tires (7000 miles guarantee)	0.066
Garage, $30 a month	0.028
Driver, $3 a day	0.075
Insurance ($3000 fire, $5000 liability, $1000 to others)	0.015
Depreciation, 20% on $3500	0.058
Total, a mile	$0.312
Total, 40 miles a day	$12.480

ECONOMICAL REO DELIVERY WAGON.

That the light delivery wagon is more economical and efficient in every way than the horse is well shown in a report received recently by R. E. Olds, president of the Reo Motor Truck Company, Lansing, Mich. The car was purchased by F. N. Rounsville, May 1, 1911, and an accurate record for the six months ending Oct. 31, shows that it covered 4553 miles, making 3773 stops. The expense for gasoline, oil and repairs was $78.86.

This is an average of 30 miles a day with a maintenance outlay of 50 cents a day, and less than 1.75 cents a mile. The earnings were $900.54, which means that the Reo truck not only earned its purchase price of $750 during the first six months of its use, but actually returned the owner a net cash balance of $150.54.

SPECIAL COAL DUMPING VELIE.

The matter of special body construction for differing lines of business is receiving renewed attention in all quarters. Lin McKie, manager of the commercial department of the Velie Boston branch, is showing a patented coal dumping body, recently placed in the market by the Velie Motor Vehicle Company, Moline, Ill., and fitted to a three-ton Velie chassis. The construction is such that the coal may be dumped from either side or the rear, and the body may be elevated to shute from any angle. It is built so that traffic will not be obstructed and is considered by many Boston coal dealers who have seen it to be a decided forward step in the matter of handling this product.

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POWER WAGON ECONOMY IN LUMBER TRADE.

ECONOMY in the power wagon is assured to be chiefly in the saving of time, but there are other qualities hardly less important. The mechanical transport has established its value in service because of superior speed, and saving is material and is really larger than appears on the face of the comparison because this economy affects not only the drivers, teams and equipment, but includes the work of the men handling the lumber in the yard as well.



Sampson Four-Ton Truck with Roller Equipment for Loading and Unloading in Service of Shevlin-Carpenter Lumber Company, Minneapolis, Minn.

The truck as delivered to the company was with a longer wheelbase than is standard and the deck of the platform contained a series of rollers with longitudinal corrugations extending from one side to the other. These rollers support the weight of the load and on them freights of lumber are pushed forward or pulled backward with minimized effort. The rolls are seven in number and two are connected by gears with winch handles, by means of which the load is carried forward or backward as desired. The two winch rollers are at the front and rear with the gearing so compounded that a load may be moved with comparatively little effort.

With the utilization of the truck it was necessary to facilitate the loading and unloading and the handling in the yard, and to adopt methods that were somewhat at variance with tradition and custom, such as giving over the piling of the loads with the forward end above the driver's head and carrying the loads on inclines, although this method is still employed in loading long timber.

It was decided that the loading should be done so far as possible without the truck and to accomplish this a two-wheeled carrier with a long plank reach was utilized. These had been employed for moving material short distances in the yard and were found to be very satisfactory. The truck is loaded by the carrier and then driven to the point where it is to be unloaded. The carrier is then pushed off the truck and the load is moved forward by the rollers. The carrier is then run back on the truck and the load is ready for the next trip.



Sampson Truck Just Loaded and Piled Load Ready for Loading on Carrier in Yard of the Shevlin-Carpenter Lumber Company

experience in the use of these vehicles demonstrates that methods, aside from actual haulage, may be improved with corresponding returns.

The adaptability of the motor wagon is a large factor in its favor. Apparently there are no limitations in its use and besides the mileage that may be obtained and the larger loads conveyed, expedition in loading and unloading, that the machines may be kept at work with the briefest possible stops, is a logical requirement.

It is apparent that the long hauls are the most profitable with any conveyance. Stopping means lessening productiveness, and this leads to systematizing any attending labor so as to minimize waits and stops. Such organization is possible with motor wagons because of the regularity and dependability of the machines. To use a truck with a minimum of lost time has been very fully realized in the case of the Shevlin-Carpenter Lumber Company, Minneapolis, Minn., which is one of the largest concerns doing business in that section.

The Shevlin-Carpenter company has in its service a Sampson truck of four tons capacity and after experiment with it methods were adopted for unloading and loading which minimize the work and give decided satisfaction. The

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tances about the yard. By piling or packing the lumber with one end on the axle of the carrier and the other on a wooden horse it was possible to make up loads at any convenient time, and to have these ready so that on the arrival of the truck it is backed to them and by use of the rollers and winches a load is carried on to the truck platform.

It will be apparent that the loading may go on at such a rate there is no delay on the return of the truck to the yard. The lumber is packed on the carrier and at a height so that the truck may be backed partly under it. Then the lumber is lowered by removing the horse and when the weight has settled on the geared roller a workman by simply turning a crank draws it on to the platform and forward as far as is necessary. The rear roller does most of the work loading and unloading, and the forward roller is employed merely to make the load snug and secure and to start it backward on the truck.

The load as packed is secured by a chain passed about it at the rear end, or that originally above the axle of the carrier, which retains it no matter what the movement of the truck. The vehicle is driven to the scene of the delivery and the place where the lumber is desired is learned. The machine is then backed or driven to this place and with the winch handles the rollers are turned and the load is backed off the platform until the rear end, retained by a chain, drops to the ground. Then the truck is driven ahead and the lumber dropped exactly where it is desired



Unloading Shevlin-Carpenter Lumber Company's Truck by Roller Equipment.



Load of Lumber Deposited in Stack Saving Time Usually Taken for Unloading.

and neatly piled, no further handling being necessary.

With this truck it will be seen that its loading and unloading is minimized so that the greater part of the time of the vehicle, with its power, speed and endurance, may be devoted to actual transportation. The fullest value of the truck is so utilized and the business of the firm is extended because it is possible for it to make deliveries at distances prohibitive with animal wagons. The illustrations show the manner of loading and unloading.

BOSTON'S PROTECTIVE DEPARTMENT.

A feature of public service in the larger centres, which is finding much favor in some of the smaller cities, is that known as the protective department, usually maintained in connection with the incorporated insurance companies doing business in the community. While in reality it is a part of the fire department and is so recognized as far as legal provisions are concerned, it is somewhat distinct, in that the various insurance concerns are assessed in proportion to the amount of premiums returned.

In Boston, for instance, the force consists of 61 men; a superintendent, three captains, two first lieutenants, four second lieutenants, 33 permanent men and 18 auxiliaries. A candidate for the force must be under 27 years of age; able to read and write English understandingly; a citizen of good moral character; have no record of crime against him; give references for the last five years; pass a rigid medical examination, and his appointment must receive the approval of the fire commissioner.

The corps is supplied with suitable apparatus intended to save life and preserve property at or after a fire. The work is principally that of preventing unnecessary water damage, and for that purpose the men spread 18 by 22-foot rubber covers, weighing from 35 to 45 pounds, over the goods and furniture on the lower floors. They also utilize several other appliances to carry off water, and when roofs are endangered they spread large "roof covers."

Boston has three separate commands. Company 1 covers the territory north and east of a line drawn from the West Boston bridge, through Cambridge, Anderson, Pinckney, Joy, Beacon, Park, Tremont, Bedford and Summer streets, including East Boston and Charlestown. This is served by two horse drawn wagons.

Company 2 has that section south and west of the previous boundary and extends to a line drawn from the Charles river through Massachusetts avenue, Southampton street and Andrew square to the water front, including that portion of South Boston not in district 1. This command has one automobile and one horse drawn wagon. Company 3 serves all that part of the city south and west of district 2, including Roxbury, Dorchester, West Roxbury and Brighton, and has two motor cars.

The horsed wagons each carry two 18-foot extension ladders and 25 covers. When more are needed they can handle about 50 at a load. The automobiles usually take about the same number, but of course, are able to carry a much greater supply when needed. The cars attached to Company 3 must make longer runs than any of the others, sometimes as great as seven miles. During the last year these machines covered 4365.6 miles in answering alarms.

So successful have the automobiles proven in this severe service, suggestion is made that insurance companies in much smaller cities would find it advisable to consider their use. Inasmuch as it is possible to do effectual work in saving unnecessary loss where runs of seven miles are undertaken, it readily may be seen that one car properly equipped would be able to cover the thickly settled portion of most cities and large towns. As has been stated, previously, it is a matter which is receiving much favorable attention in many localities at present.

NEW YORK BRANCH FOR MOTZ TIRES.

The Motz Tire & Rubber Company, Akron, O., has opened a branch for its Motz tires in New York City at 55th street and Broadway. E. P. White, formerly connected with the Goodyear Tire & Rubber Company, is the manager.

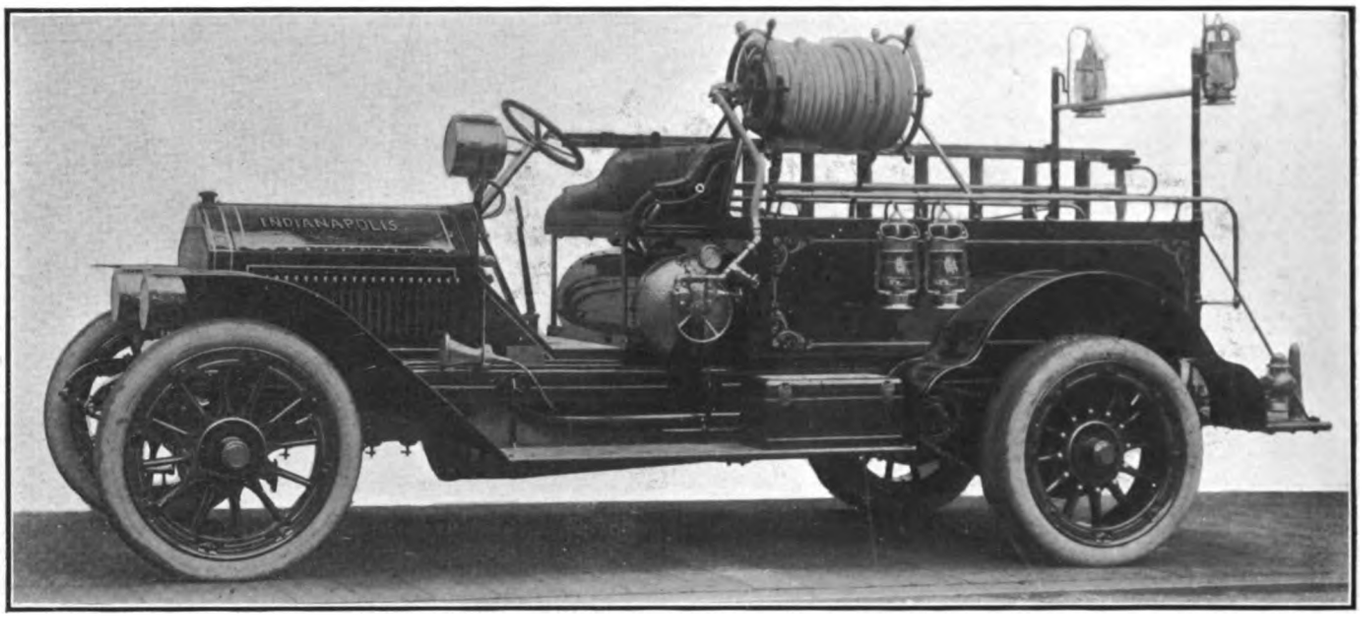
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FIRE DEPARTMENT NOTES

The new year will see another piece of motor propelled apparatus added to the fire department at Indianapolis, Ind., as the delivery of a combined hose and chemical wagon is expected early this month. In the accompanying illustration is shown the automobile which was made by the American-La France Fire Engine Company, Elmira, N. Y., and which is fitted with a 40 gallon chemical tank and reel of hose as well as 1200 feet of 2.5-inch hose and usual equipment.

The vehicle is propelled by a four-cylinder, four-cycle, water-cooled motor with a 5.5-ton bore and six-inch stroke and is rated at 70 horsepower. Ignition is by Bosch dual system, including storage batteries, and the clutch is a multiple disc. The gearbox provides three speeds forward and reverse and final drive is by side chain. Pneumatic tires are fitted, single to front wheels and dual to the rear. The wheelbase is 140 inches.

The following cities and towns are considering or have appropriated money for the purchase of motor propelled fire apparatus: Lakewood, O.; Elmgrove, W. Va.; the Fire Fame Company, Wilmington, Del.; Dayton, O.; Sumter, S. C.; Kalamazoo, Mich.; New London, Conn.; Chambersburg, Penn.; Derby, Conn.; Meriden, Conn.; Waukegan, Ill.; Pasadena, Cal.; Terrell, Tex.; Rome, N. Y.; Newport, O.; Shreveport, La.; Bakersfield, Cal.; Ottawa, Ill.; Zanesville, O.; Mattoon, Ill.; Mankato, Minn.; Winona, Minn.; Charlotte, Mich.; Petaluma, Cal.; Sherman, Tex.; Masillon, O.; Fort Collins, Col.; Alberquerque, N. M.; Fort Wayne, Ind.; Manitowoc, Wis.; Everett, Wash.



Hose and Chemical Automobile Built by American-La France Fire Engine Company for City of Indianapolis, Ind., Which Will Be Placed in Service This Month.

Another point in favor of the automobile was brought out recently in New York City, which has installed many pieces of motor driven fire fighting devices. The water tower is the clumsiest vehicle to handle, especially when backing into quarters, and with horses the operation usually consumed 15 minutes or more. With the motor it is a simple matter for the chauffeur to straighten it out and back right in, as he has no horses to swing. And when the engine is in position the power is shut off and there is no need of further effort. Horses have to be looked after, and the harness suspended on the overhead supporters.

The residents of Thompsonville, Conn., turned out en masse recently when the Knox combination chemical and hose truck, made by the Knox Automobile Company, Springfield, Mass., arrived and was turned over to the fire department by Vice President Alvin D. Higgins of the Hartford Carpet Corporation, donor of the machine. The parade was headed by the Carpet City band, followed by the new machine after which were the various pieces of apparatus and members of the company. The line of march was through the principal streets and much red fire was burned in honor of the new vehicle. At the fire house the machine was formally turned over and the committee thanked the giver in an appropriate manner. The motor car is propelled by a 50 horsepower engine and is one of the latest turned out by the Knox company. It carries a 40-gallon chemical tank, also three-gallon hand extinguishers, and is fully equipped with fire fighting appliances.

White Plains, N. Y., has received a combination hose and chemical wagon from the Locomobile Company of America, Bridgeport, Conn., and the machine was designed and constructed for heavy service. The car is propelled by a four-cylinder, four-cycle, water-cooled motor with a five-inch bore and six-inch stroke and its horsepower is rated at 60. Drive is by side chains and a four-speed forward transmission is employed. The vehicle is painted white with nickel trimmings and will accommodate 10 men in addition to the driver. Two 35-gallon chemical tanks as well as hand extinguishers are carried. In addition to the 350 feet of chemical hose the equipment includes the usual fire fighting appliances. Irvington-on-the-Hudson has ordered a similar machine.

Waterloo, Ia., is said to be the first in that state to adopt the mechanically propelled fire apparatus, having contracted for a combination hose and chemical wagon to cost $5250. The special equipment consists of a 40-gallon chemical tank, and 12,000 feet of hose. The vehicle weighs 7200 pounds.

The Winnipeg, Man., fire department is advertising tenders for a second automobile hose wagon, and it is

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stated on good authority that the city contemplates the conversion of the entire fire fighting outfit to motor vehicles.

The result of the first practical test of the automobile fire engine and hose wagon recently placed in service at Ottawa, Ont., was such that a fire loss was kept down to $500, which with the ordinary methods probably would have been at least $3000. The fire in question broke out in the attic of a large dwelling. A line of ordinary hose was laid on the outside of the building, while the chemical stream was utilized on the inside. The result was that the flames were extinguished with a loss confined almost entirely to the upper part of the house. Had water been used in the ordinary way, the damage to the lower floors would have been considerable. The chief of the department was well pleased with the result.

Two outfits of chemical fire apparatus, mounted on chassis made by the White Company, Cleveland, O., were submitted to a test by Commissioner Johnson of the New York City fire department recently. In order to imitate real conditions as nearly as possible a wooden structure was erected in front of the department's repair shop at 58th street and 12th avenue, being filled with shavings and dry wood, and the materials soaked with kerosene. The construction was such that a good draught prevailed.



Chemical Fire Apparatus Fitted to White Chassis Being Tested by New York City Fire Department.

When a match was applied it blazed fiercely and it was allowed to burn some little time to obtain a good headway, before word was given to the firemen to turn on the streams from the chemical wagons. Three minutes later it was merely smoking embers. The fire was checked so quickly and effectually that the entire outside walls of the structure remained in good condition, being simply charred. The accompanying illustration presents the automobiles and the scene of the conflagration.

West Haven, Conn., has found its first automobile fire engine so satisfactory that another machine is to be added and utilized as a flying squadron. The first wagon was severely tested and even driven through streets heretofore considered impassable for vehicles. Once the wheels sunk up to the hubs in a mudhole and the motor stalled. When restarted the engine backed the vehicle out, and in a second trial went through with a delay of but a few seconds. Two members of the department have been taught to operate the machine and others are being instructed for the purpose of driving the new motor car upon its arrival.

The members of the fire engine company of Pocasset, R. I., have made a request that the converted pleasure vehicle which was overhauled and painted recently be equipped with fire fighting appliances. If the authorities do not have the funds for this purpose the firemen propose to contribute the money.

Tire expense is an important factor in the cost maintenance of automobile fire fighting apparatus and in a recent letter to the Goodyear Tire & Rubber Company, Akron, O., Chief Mertz of the department of that city gives some data relative to this subject. The city placed a triple combination Webb apparatus in service in July, 1909, and the vehicle weighs 7800 pounds without men. Since that time it has covered approximately 2000 miles, and in answering alarms carries, on an average, six men and sometimes as many as 14. During the two years of use the shoes have not delayed the machine in responding to alarms and it is stated one of the casings contains its original air.

Lakewood, O., has passed an ordinance calling for a bond issue of $15,000 to purchase motor apparatus, and Elmgrove, W. Va., has authorized the purchase of a chemical wagon and hook and ladder truck, both fully equipped.

Fire Commissioner Johnson of New York City has written Mayor Gaynor, calling attention to the condition of some of the streets in the central portion of the city which are so bad that the automobile fire apparatus cannot use them. Many obstructions and breaks in the pavements are noted. The investigation is being made in view of the fact that within the next year 150 pieces of motor apparatus will be in service, as against 29 automobiles now being used.

Fire Chief A. V. Bennett of Birmingham, Ala., which city is replacing its horse drawn equipment with motor propelled apparatus, will add six more combination hose wagons to those already in service. The new machines will be similar to those being utilized with the exception that the motors will be more powerful. According to the chief the automobile is four times less expensive to maintain than the animal and during the first month of service, figures show that Hose Wagon No. 1 answered 45 alarms, traversed 578 blocks, used 55 gallons of gasoline, one of cylinder oil and .25 pound of grease. The total cost of this maintenance was $5.81. Another similar equipment answered 50 alarms, traversed 930 blocks, practised two hours, used 35 gallons of fuel, two of oil, .25 pound of grease, and changed a gas tank for $6.71. A converted steam engine answered 21 alarms, traversed 325 blocks, used 46 gallons of gasoline, about one of oil, one pound of grease, replaced dry batteries and a gas burner for $5.11.

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MECHANICAL NOTES AND TIPS FOR DRIVERS



GENERATOR TROUBLES AND CAUSES.

Many commercial vehicles utilize a generator to supply acetylene to the headlights and while these devices are efficient when handled properly, they give more or less trouble if neglected. They require attention other than replenishing the carbide and water as will be explained herein.

Acetylene is composed of 12 parts of carbon to one of hydrogen by weight, or 92.3 per cent. of the former and 7.7 of the latter. Its density is about .91, and its weight at 32 degrees Fahrenheit is .073 pound a cubic foot. It is without color, has a strong odor, and is poisonous to breathe, in about the same degree as ordinary gas.

It is manufactured by combining water with calcium carbide, the latter being a mixture of coke and lime which has been fused in an electric furnace. The carbide is reddish brown and gray, somewhat crystalline, and decomposes

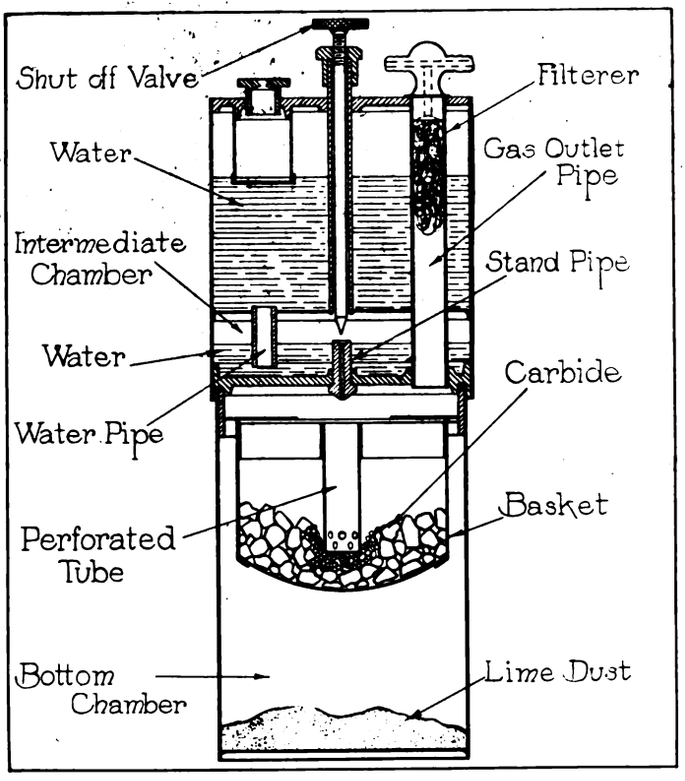


Fig. 1—Depicting the Components of a Conventional Type of Generator and Method of Operation.

in the water like ordinary quicklime, which it is in fact, when the calcium has combined with the oxygen forming oxide of calcium. At the same time the carbon unites with hydrogen, resulting in the desired acetylene.

Pure carbide of calcium will produce 5.4 cubic feet of gas a pound, but the commercial product rarely yields more than 4.5 cubic feet. This is the most brilliant illuminating gas known and will give a light of about 240 candlepower when burned at the rate of five cubic feet an hour, while good coal gas only results in 16 candlepower at the same rate of combustion. Acetylene can be reduced to liquid form at a temperature of 60 degrees by a pressure of about 600 pounds a square inch. It corrodes copper and silver but does not affect to any great extent, brass, iron, lead, tin or zinc.

If acetylene were burned with an ordinary jet, it would have a yellow tint as with illuminating gas, but when utilized in the lighting system of the automobile it is mixed with air. This mixing is brought about by the arrangement of the burner which is provided with openings for both the gas and atmosphere. Those of the former face each other, and when the acetylene is mixed with air by means of the other two apertures, the flames, when ignited, meet and form a fishtail blaze. The office of the air openings is similar to those employed on a gas cooking range, although the latter are much larger in size. This drawing in of the oxygen at the tip of the burner raises the temperature of the flame to a point where a white blaze is obtained. It is estimated that 1385 heat units are produced by the combustion of one foot of acetylene.

The generator employed on the motor car consists of a water tank, separate compartments for the carbide and gas, and a filter chamber. Water is dropped on the carbide by one of several methods, and as soon as the two come in contact, the latter begins to decompose, giving off gas as previously described. This collects in a reservoir, and by its natural pressure forces its way through the filter chamber, which is filled with cotton, wool or similar material, the carbon therein being arrested.

When the pressure reaches a certain point it is cut off and no more is generated until this falls again, allowing the water to flow once more. At Fig. 1 is shown a sectional view of a generator and the principles of regulating automatically the dripping of the water. When this is poured into the upper tank it runs down into the second chamber by means of a connecting pipe, and overflows the standpipe. If there be only atmospheric pressure in the lower compartment, water will drop freely into it. However, when the carbide is present, the first few drops reaching it will generate gas, the pressure of which is communicated through the standpipe to the middle chamber and forces a portion of the water back into the tank.

The gas escapes through a tube surrounded with water to keep it cool and is forced upward through a filter and one or more outlets. As it leaves the pressure in the carbide receptacle diminishes and the water in the middle chamber rises until it overflows the standpipe again, when the same process is repeated. Constant pressure is thus maintained whether one or more burners are being utilized. Thus it will be seen that an increase above normal stops the dripping of the water and that a fall below that starts the fluid.

When a generator is performing its proper functions the deposit of lime dust in the bottom of the receptacle will be dry. This denotes that the carbide is clean and in condition to respond to the next drop of water. If the burners and tubing be clear there should be sufficient gas at the tips to produce a good white flame. When there is a small flame at the jets and the pipes are free, and upon violently jarring the generator, this flares and then dies away, an examination of the carbide holder will show a dense, soggy mass, through which the water percolates with difficulty and the pressure is lowered. When the car is traversing smooth roads the wet lime, swollen to about the bulk of the carbide whence it originated, packs itself around the remaining lumps, with the same result. When the automobile gives a jolt, the packed mass is loosened, and the water rushes to the carbide causing a violent flaring at the burners. When the generator is shut off, and the lights continue to burn for some time, it also denotes similar conditions. To obtain satisfactory results the gas should be delivered to the burners clean, cool and dry and a filter is incorporated to catch the impurities and the generating chamber is water jacketed. If the vessel be left for a long

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period there should be no deterioration of the carbide. If it dissolves it is safe to assume that the device is at fault.

In some types the drip of the water is regulated by wicks or strands of string. These may become clogged and usually are so arranged that they may be removed and cleaned. It is also possible that the filtering device may become fouled or that where drip pins are utilized they may have become bent or dirty and thus fail to perform their function. Lime acts as a heat retainer, causing the formation of tarry compounds from the gas, and when the lights are extinguished the water in the lime is sometimes sufficient to consume all the remaining carbide. It is essential that the lime should be separated from the carbide and should drop to the bottom of the container. It is also necessary that the perforated tubes around which is placed the carbide should be clean as well as dry to obtain the best results. If upon cleaning these members, and other working parts of the device, faulty operation should continue, it is best to ship it to the manufacturer.

Before condemning the generator it will be well to examine the tubing and the burners. The latter should be removed, making possible a test of the pipes for obstructions. Many drivers examine burners by blowing through them without closing the air apertures, and when cleaning them with a tire pump also fail to observe this precaution. There is a needle-like device upon the market for clearing jets which will facilitate the operation.

More or less moisture is present in the tubing, this being condensed from the gas. This occurs in the first 12 inches or so after leaving the generator and consequently the piping and rubber connections from the vessel should slope directly downward to the lowest point in the system and continue a foot or more in order to drain any possible moisture toward the generator instead of in the direction of the lamps. Satisfactory lighting is not obtainable with copper tubing although commonly used. It is too soft to hold its shape and consequently sags, forming pockets in which the condensation is likely to collect. This small piping clogs readily owing to the chemical action of acetylene on copper, which produces a black scale. The action is sometimes so rapid as to choke a .125-inch pipe in a few weeks. The proper material is brass, .25 inch inside diameter, although it is known as .125-inch pipe size. It is sufficiently large and stiff to hold its shape and does not clog easily.

In removing the residue of carbide that has become caked to the device it is bad practise to employ a file, a screw driver or any metal, because the residuum left by the carbide after the generation of acetylene attacks the copper of the receiver and chemically combines with it, forming a substance known as acetylide of copper. This is a highly explosive product and does not require much excitation to set it in action. If metal be used in cleaning, the process should be performed in water. A scraper of hard wood is preferable.

CARE OF STORAGE BATTERIES.

Many trucks are equipped with storage batteries either for starting or an auxiliary, and unlike the dry cell these require care and attention in addition to charging. They should be tested frequently and when the discharge limit of 1.8 volts a cell is reached they should be recharged. All corrosion should be cleaned from the terminals and these members treated with white vaseline or some anti-sulphuric acid solution. When the binding members are frozen and will not loosen easily, force should not be employed.

When the application of kerosene fails to move them heat will have to be applied, but care should be taken not to expose the lead of the lug to the flame. The best method is to heat a piece of metal and place it on the nut or screw member. The metal should not be too hot, but more at a black heat.

When the terminals of the wires leading to the battery are corroded, which is indicated by a green deposit, this should be removed and the metal covered with vaseline. As the corrosive substance is more or less a non-conductor of electricity it should not be allowed to gather. A little care in this respect will lengthen the life of the battery as well as increase its efficiency.

REPAIRING EXPANDING BRAKES.

Some cars are fitted with the expanding type of brakes and these may be metal to metal or lined with friction material. They are actuated by a cam which spreads the members designed to grip the drum of the wheel. The expanding device and faces of brake members may be so badly worn that but little friction is set up between the contacting materials. At Fig. 2 A is depicted a brake of the expanding type with the cam and faces in this condition and it is obvious that the member will not function properly.

A simple method of building up the faces is shown at B. The metal is drilled and tapped to take two cap screws and these may be adjusted to the opening required and then locked as outlined at C. Another method is to rebuild the faces with a strip of metal, the latter being fastened by machine screws. The holes for these members should be countersunk.

POPE-HARTFORDS DELIVER BREAD.

The Acme Tea Company operates a chain of over 200 stores in Philadelphia and suburbs, and in addition to its

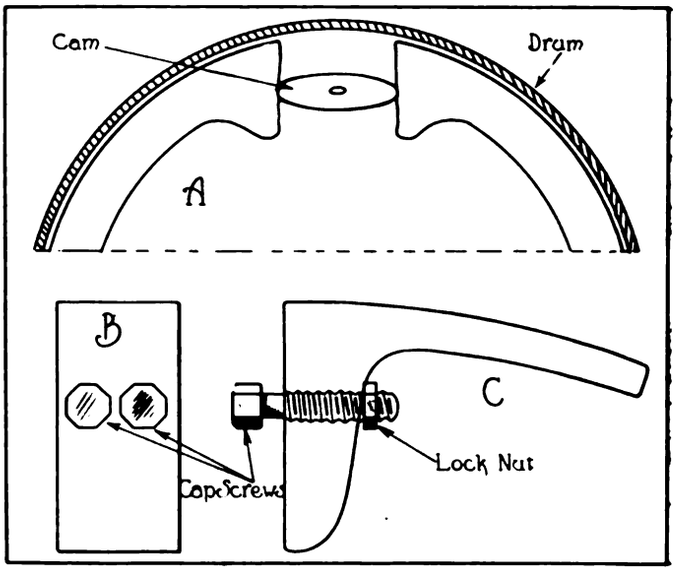


Fig. 2—Some Brake Hints: A, Expanding Type, the Cam and Faces of Which Are Worn; B, Repair Made with Cap Screws; C, Method of Adjusting and Locking.

tea trade carries on an extensive baking business. Early each morning the freshly baked bread must be delivered to the various stores with regularity and dispatch. The company has in service two Pope-Hartford three-ton trucks, made by the Pope Manufacturing Company, Hartford, Conn., and will place the third in commission within the near future. After the day's supply of bread has been distributed the cars can then be used for the purpose of general delivery.

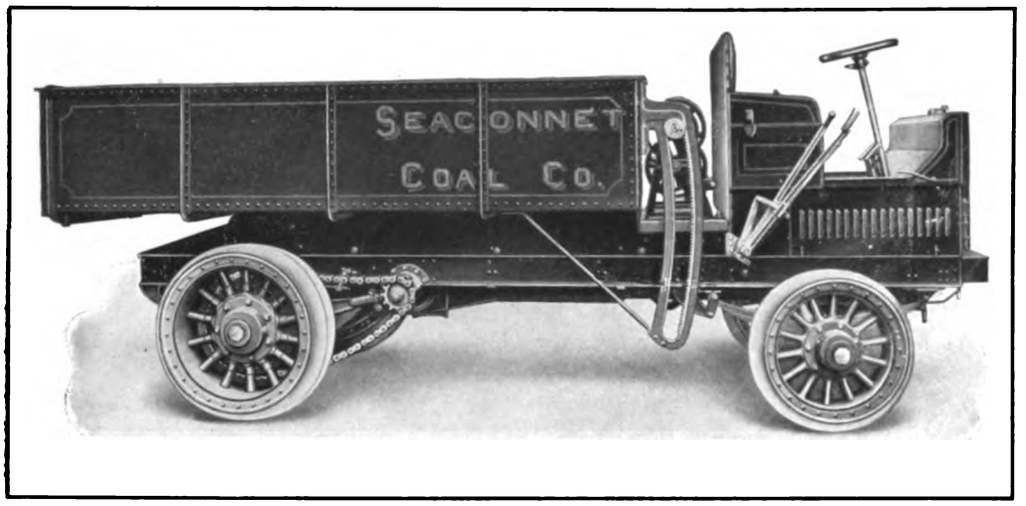
COMPETING WITH RAILROADS.

An effort is under way looking toward the organization of the Haverhill Auto Express Company, which is to operate a fleet of motor trucks between Boston and Haverhill, Mass. Two or three vehicles have been in service over this proposed line for some months making regular delivery of goods. The new plan contemplates the use of at least seven machines, to be started from Boston at one-hour intervals, beginning at 5 in the morning. These would deliver their loads in Haverhill and pick up shipments to be delivered on board the New York boats that night, reducing the time necessary to reach the metropolis by at least one full day.

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QUICK DUMPING WAGON AND TRUCK BODY.

HANDLING of the load is a problem of much importance in vehicular transportation. The minimizing of time and labor in loading and unloading has been given much attention. This applies to animal as well as power driven transports. Many devices have been perfected for unloading different materials and commodities from wagon bodies, some only useful for special service, and others more general in their application and use. Naturally those which may utilize the one equipment for the greatest number of purposes can be regarded as being the most serviceable.



Alco Truck with Monahan Dumping Body of Six Tons Capacity, Without Flare Boards, Utilized for Haulage of Coal.

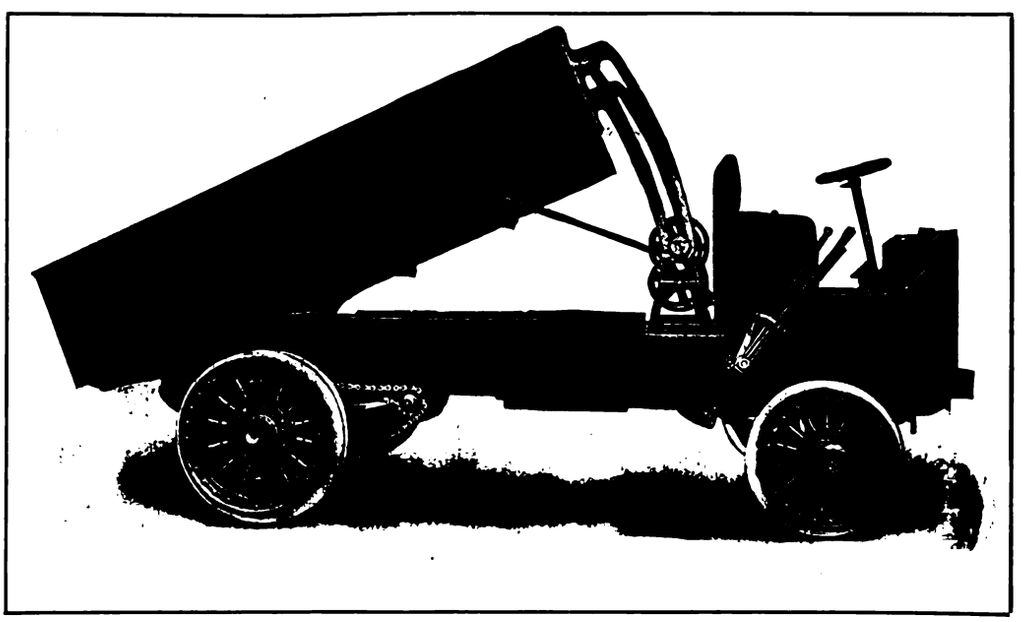
A body that has many qualities and features is the dumping outfit built by the Monahan Vehicle Company, Providence, R. I., with capacities ranging from two to 10 tons, and which bodies are used very broadly. This body is constructed of No. 10 steel plate, there being generally three and sometimes four plates forming the sides and bottom, and another the forward end, while the end gate is a separate construction that is suspended from the top of the sides at the rear end.

The proportions of the material differ with the capacity of the body, the allowance being 37 cubic feet for a ton of bituminous coal. It might be stated that 40 cubic feet is the accepted average for a ton in general merchandise transportation. This is, of course, exceeded when the bulk is large and weight proportionate to or less than bulk average.

This body is mounted on the chassis that the forward end may be elevated to give the body an angle of 42 degrees, considered sufficient for the gravity movement of all loads save under unusual conditions. To so elevate the body it is necessary to locate the fulcrum of the unloading apparatus practically above the rear axle, and that the rear end of the body may be lowered, the rear end of chassis frame is cut off. This means simply shortening the side members of the frame and restoring the end member and the reinforcements and stays.

The size of the rear wheels with practically every power wagon is such that the tires rise above the top of the frame side members and as it is necessary to have the centre of gravity as low as possible this construction necessitates a body that will have a width of about 66 inches at the forward end and 78 inches at the rear, with side plates at a height and length to give the required capacity. The rear end of the body must extend beyond the chassis frame from a foot to two feet. Perhaps 18 inches is a fair average. As the body is wider than the chassis frame, to elevate it sufficiently above the wheels to permit of full spring action a wooden frame is fitted with sides that in large bodies are 12 inches in height. From the fulcrum point to the rear of the chassis frame the sides of the wooden frame slope at an angle of 42 degrees. Forward of the body the sides of the bolster frame are cut to six inches in height. This space is heavily decked with oak for the installation of the hoisting mechanism, which is bolted to the frame. The entire bolster frame is left open to give fullest accessibility of the gear case, jackshaft, driving shaft, etc.

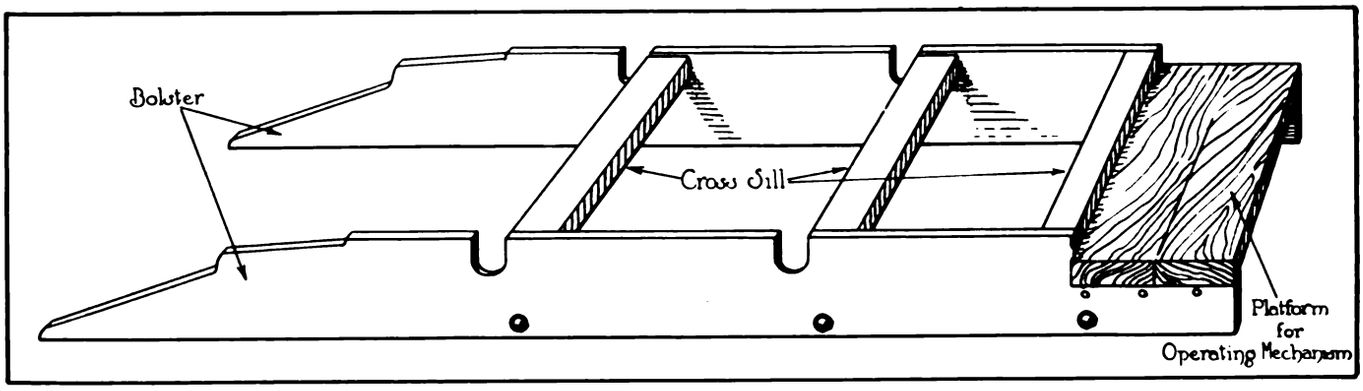
When the body is elevated it is supported by the hoisting gear forward and by two heavy hinges, one at either side of the chassis. These hinges are riveted to the bottom of the body and its frame and bolted to the bolster, the bolts passing through the bolster and the chassis frame. The hinges are milled so there is a precise fit. When the body is raised it is entirely clear of the bolster. Three steel members, the transverse shape and size of the body, are formed of T plates, these being with wings two inches wide and .3125 inch in thickness. Two other steel members are made in angle form with wings two inches wide and of the same thickness. The two steel angles form the end frames of the body and the three T plates the centre members, to which the body plates are riveted. The tops of the side and end plates are reinforced by a steel angle of the same proportions securely riveted. Across the rear end at the



Monahan Dumping Body Fitted to Alco Truck Elevated to Fullest Height for Unloading—Body Designed for General Haulage.

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top is fitted a steel rod or bar which stiffens the construction and on which the end gate swings. The end gate is a steel plate reinforced as is the body, and when lowered it is held by a transverse bar which is constructed with two small lips which bear against the lower edge of the gate, which bar is operated from the side by a hand lever.



Plan of Bolster for Chassis for Installation of the Monahan Patent Dumping Body, Adapted in Proportions to the Size of the Frame and Body.

The hoisting mechanism consists of two racks attached to the forward end of the body, at the end of the transverse body plate, the lower end of the racks extending to about the height of the front axle. The ends are stayed by rods having angles of about 45 degrees riveted to the bottom of the body, close to the side, and to the body frame. While the body rests on the bolster normally it is possible to raise it easily by a crank which operates a succession of gears and pinions that mesh into the racks. This hoisting apparatus and the body are patented devices. It is claimed for the body that it may be elevated to its full height with any type of vehicle in less than two minutes and the load deposited wherever desired. The truck or wagon may be backed to any point and the load dumped, the body not being in contact with the ground. Obviously the lowering operation is quite as easily accomplished. Thirty-one revolutions of a hand crank raises or lowers the body.

Bodies of this class are built for hauling of coal, brick, stone, gravel, sand, building materials, ice, and, in fact, any commodity, including lumber, for the load may be drawn out when one end rests on the ground. All contents slide on the smooth metal floor of the body. These bodies have been constructed for vehicles in all parts of the country and shipments have been made to southern California by this company.

APPRECIATES TIRES AND SERVICE STATION

That the service stations of the United States Tire Company, New York City, are appreciated by the users of commercial vehicles is shown by several letters received by that company one of which is reproduced herewith. Writing from Springfield, Mass., the manager of the Saurer Motor Truck Agency, states: "I can recommend your tires with pleasure, as we have been using them on all our trucks for over 18 months and have had very few replacements; every one entirely satisfactory to our concern. We must also give your service station in this city much credit for the prompt attention that has been shown us on all occasions, our tires having been changed so that we have not lost any time."

SPEEDWELL DEALERS IN CONVENTION.

In an effort to improve the details of salesmanship with respect to its product in particular, the Speedwell Motor Car Company, Dayton, O., maker of Speedwell trucks, invited its dealers in all parts of the country to assemble at the factory, Dec. 11 and 12, paying their expenses both to those concerns which unquestionably will profit by their use, and that cars should be so represented previous to the sale that the purchaser will be acquainted with every probable item of expense connected with their operation and maintenance. This convention is indicative of the thorough manner in which this concern is pursuing the matter of sales.

SAMPSON IN TELEGRAPH SERVICE.

The commercial vehicle has invaded another field and this time it is the telegraph division of the Detroit fire department. The authorities conducted a series of tests with a 3000-pound Sampson truck, made by the Alden Sampson Manufacturing Company of that city, a constituent of the United States Motor Company, New York City. The car was commissioned to deliver supplies to all of the fire stations in the city and completed the circuit in eight hours. A team of horses required from two to three days for the same work.

The telegraph division uses the machine to draw cables through underground conduits and in the accompanying illustration is shown the apparatus at work. A winch, driven by the power of the motor, and operated by a lever, winds



Power Driven Winch Utilized on Sampson Truck for Drawing Cable by Detroit Fire Department.

the cable, superseding the slower method of a hand windlass. The automobile is in service night and day and in addition to replacing the horse equipment formerly employed, performs work that required additional teams.

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POWER WAGON AMBULANCE AND HEARSE.

THE requirements of those who desire to utilize motor vehicles for business purposes are such that specialization in body equipment for standard chassis is becoming more and more necessary. Those who have need of bodies for commonplace service often seek something distinctive in design and yet absolutely serviceable and enduring.

An excellent example of the possibilities in work of this character was recently delivered by the Monahan Vehicle Company, Providence, R. I., to J. P. Cleary & Son, Boston, Mass., this being installed on a Sampson 1500-pound power wagon chassis and purposed for a combined undertaker's ambulance and wagon.

The chassis was sent by the builder to the works at Providence where the body was designed and constructed. The accompanying illustration gives an admirable idea of the general design. The body is eight feet in length and 48 inches wide, with the sides of the seat enclosed and the roof carried forward of the dash nine inches. The sides of the body proper are unbroken and are finished with molding that forms panels, the upper and lower being wide and the centre one narrow. In the centre panel is a large plate bearing the firm name. The finish is plain and in black.

At the rear is a step carried on brackets and above this



Specially Built Body for a Combination Ambulance and Hearse Installed on a 1500-Pound Sampson Chassis.

double doors open outward, these doors being fitted with windows that drop into the lower section. At the front of the body and behind the seat for the driver is a window that swings from the roof and which lifts inside the body, where it may be hooked if desired. The interior of the body is the natural wood and at the sides are racks, raised or lowered as occasion may demand. The floor may be removed for ready access to the chassis mechanism, and rollers are fitted to the sections for the easy removal of any load that may be carried. The body may be closed tightly as protection against dust in the event of a lengthy trip.

The sides of the body are carried forward to enclose the sides of the seat, a lengthy bracket supporting the extension of the roof. Into the sides are fitted large lights of heavy plate glass, affording the driver a view of either side of the way. The foot room in front of the seat is ample for comfort and the cushions and back of the seat are luxuriantly upholstered in tufted leather.

The protection of the long hood can be increased by the use of a storm front or windshield and in cold weather one or the other will be used. The control is at the left side, this being especially adapted for service in traffic. At either side of the body, back of the seat, are installed side lamps, while on the dash is carried another set. They are all oil-burning. All of the fittings are nickeled, that being more in keeping with the service for which the wagon is intended.

The absence of running boards, the short fenders and the single step at the side, with the muffler carried crosswise back to the dustpan, impresses one as being odd, but there is nothing unsightly in the appearance of the chassis, while the body is thoroughly commendable from every point of view.

WHITE ENGINEER STUDIES FOREIGN CABS.

M. F. Melhuish of the White Company, Cleveland, O., recently returned from a tour abroad, during which he visited all the principal European cities for the purpose of studying the construction and plan of operating motor driven public service conveyances This concern has announced its intention of making the production of taxicabs and motor 'buses a definite part of its business.

Mr. Melhuish states that in London alone there are 7200 taxicabs in daily operation, but he would not venture to estimate the number of motor 'buses there. The motor practically has displaced the electric street car in that city. The General Omnibus Company, one of the largest concerns in London, has its own factory where it makes its cars complete, producing at least 20 cars weekly and utilizing all of its product on its own lines within the city.

He holds that one of the chief reasons why taxicabs are so much more common in European cities than in America is that it costs only a fraction as much to ride in them there as it does here. In London, the fare for riding in a motor 'bus is twopence, or four cents in American money. No transfers are given and if a passenger wishes to travel beyond the end of any particular line he must pay an additional fare.

The type of motor 'bus used in London is very similar to the double-decked vehicles which are so familiar as a part of the traffic on Fifth avenue in New York City. Each is marked to denote the territory it covers, much the same as our street cars.

The rider in a taxicab in London pays only 16 cents for the first half-mile and four cents for each additional half-mile. This explains the otherwise amazing fact that there are 7200 taxicabs in that city.

Most of the London cabs are equipped with four-cylinder engines because of the hills in some districts, but in Paris where the streets are almost invariably level, the vehicles have one and two-cylinder engines. To the American eye, the London taxicabs are much more sensible than those of Paris and other European capitals, where the body design usually seems "freakish."

The London branch of the White Company is reported as thriving. It will surprise many people to know that it employs 300 men in its factory department. When White cars are sold in Europe, the home office ships the chassis only to its London branch. There they are fitted with bodies conforming to the style suitable for that particular section in which the car is finally to be delivered.

FIRST AMERICAN-BUILT COMMER.

The distinction of purchasing the first Commer truck made in this country by Wyckoff, Church & Partridge, Inc., of New York City, belongs to the Eagle Storage Warehouse of Brooklyn. This concern already has one Commer, imported by the American agent last summer, and it has been doing such good service that a repeat order was given for the first vehicle produced by the new factory. It will be a duplicate of the English product, all the jigs, tools, dies and patterns having been imported for this purpose. It will be of the 4.5-ton capacity and fitted with the regular van body. The American product will be designated as the W. P. C. Commer. The Boston agent has claimed the second machine.

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The Mogul Truck Company of Chicago was incorporated recently for $125,000. The incorporators include G. C. Griffiths, J. S. James and F. Rawson.

The Motor Cab Company of Boston has been incorporated for $1000. Otto A. Lawton of 31 Irvington street, Boston, is named as president and treasurer.

The M. & P. Electric Vehicle Company was incorporated in Detroit recently for $10,000. Myron C. Messiman and Burton Grandy are named among the incorporators.

The Wishart-Dayton Auto Truck Company of New York City has been incorporated for $25,000 and the incorporators include R. A. Inch, S. E. Wishart and J. B. Smith.

The Electric Motor Car Company, recently organized at St. Louis, Mo., will handle electric commercial vehicles equipped with the Walker balance gear drive.

The Federal Motor Car Company, Chicago, has been incorporated for $10,000, the incorporators including C. W. Rhodes, David B. Rosenthal and Leo S. Kositchek.

The Amalgamated Motors Company, Los Angeles, Cal., was incorporated recently for $500,000. The directors named are as follows: C. B. Croner, C. J. Schroeder and J. L. Kirkman.

The Buffalo Motor Vehicle Service Company, Buffalo, N. Y., has been capitalized for $100,000 with the following incorporators: W. R. Huntley, J. H. Vail, C. R. Huntley.

The B. Gerdelman Manufacturing Company, St. Louis, Mo., has moved into new quarters on Washington avenue, near Walton. The new building was completed recently.

The Wachusett Cab & Automobile Company, Kittery, Me., was incorporated recently for $5000. Horace Mitchell is named as president and treasurer, and C. E. Smothers as clerk.

The Motor Accessories Manufacturing Company, Marshalltown, Ia., has been incorporated for $10,000, the incorporators including Charles C. Eldridge and Edwin J. Beebe.

The L. A. Mitchell Company, Jacksonville, Fla., has taken the agency for the Dayton truck. W. A. Baxter, special factory representative, visited the new agents recently.

Frank A. Babcock of the Babcock Electric Carriage Company, Buffalo, N. Y., was a visitor in Boston recently, where he was entertained by the Electric Vehicle Club of that city.

William C. Durant was given a banquet recently by the business men of Flint, Mich., in recognition of his making that city one of the leading automobile centres of the country.

The Motor 'Bus Company of Chicago has been incorporated for $60,000 and will operate and maintain motor 'buses. The incorporators include Clarence E. Morris and Frank P. Page.

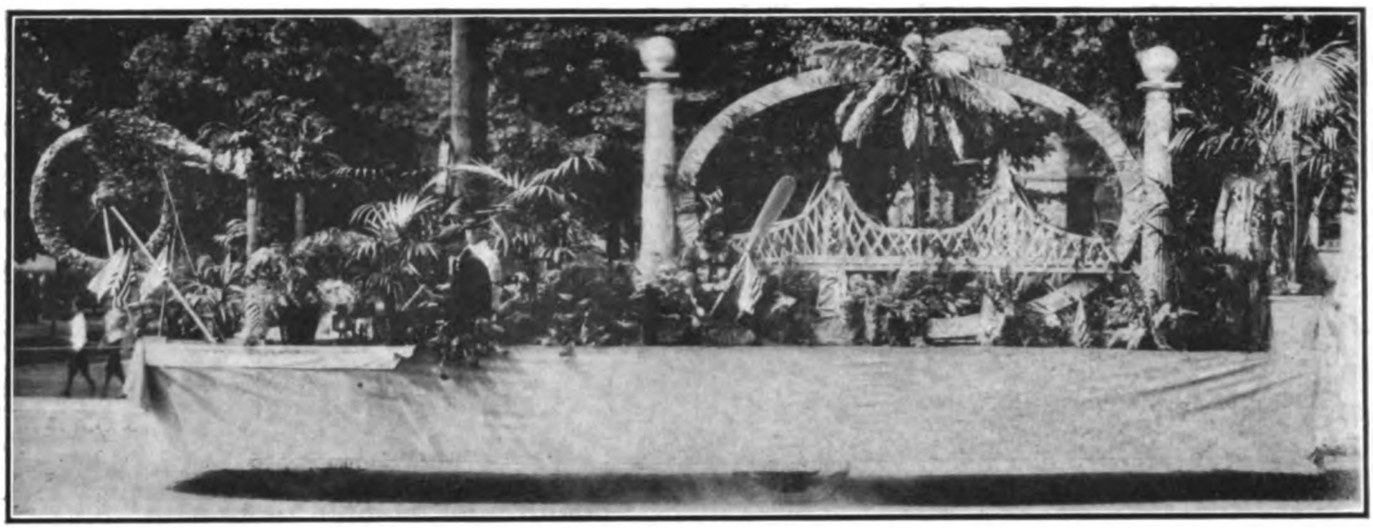
The American Silent Motors Company was incorporated at Los Angeles, Cal., recently, for $2,000,000. The directors named include Benjamin Waterfall, R. J. Connors and Ernest Kouwenhoven.

The Royal Automobile Machine Company, Brooklyn, N. Y., has been incorporated for $10,000. The incorporators include Sydney Solomon, Celia Rothstein, Louis B. Brodsky and William M. Abel.

The White Garage Corporation, Los Angeles, Cal., has been incorporated for $100,000. The incorporators named are: F. Fay Sibley, Martin E. Tew, R. Roy Sibley, C. M. McCully and E. L. Sibley.

The Batavia Company of Pennsylvania, New York City, has been incorporated for $30,000, and the incorporators named include H. W. Newburger and M. Lustig of that city, and D. Weiss of Yonkers.

The Kissel Kar New England Branch has moved to 10 Columbus avenue, Motor Mart, Park square, Boston. These quarters will be occupied until spring when the new building will be completed.



Three-Ton White Truck, a Feature of Parade Held Recently in Honor of Opening of a New Bridge at Pittsburg, Penn.

The Goodyear Tire & Rubber Company, Akron, O., has removed its St. Louis, Mo., branch from Olive street to Locust. The new building is one of the most complete of its kind in the Southwest.

The National Spring Tire Company, Chicago, was incorporated recently for $125,000. The incorporators named include Charles L. Sigmann, Jr., Louis Valence, Charles H. Jackson and F. J. Karasek.

The Boulevard Company, Waterbury, Conn., has been incorporated for $5000. The officers consist of: President, William E. Russell; vice president, Lizzie M. Russell; treasurer, Albert Delay; secretary, Charlotte M. Delay.

The Krupp Motors Company, Wilmington, Del., has been incorporated for $250,000 and will manufacture motor vehicles and parts. The incorporators include D. Morgan, G. H. Anderson and James McMorran, all of Pittsburg, Penn.

The Stover-Lang Company of Boston has been incorporated for $40,000 to sell speed and mileage meters. The directors are: President, George H. Lang; treasurer, Charles L. Stover, 221 Columbus avenue, Boston, and Norman F. Pratt.

Col. Grantley P. Postles has leased the garage and show rooms at 220 West 10th street, Wilmington, Del., and will han-

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dle commercial and pleasure vehicles. Henry G. Kurtz, agent for the Mack truck, will be associated with Mr. Postles.

The Autocar Sales & Service Company of Philadelphia, will establish a branch at 714 Orange street, Wilmington, Del., where a full line of commercial vehicles will be carried and a service station maintained for the users of Autocars.

The Atlantic Auto Truck Transportation Company, Haverhill, Mass., has established quarters at 65 Water street and will conduct a general transportation business. One machine is now in service and the addition of others is contemplated.

F. H. Quick, formerly with the Gibson Auto Company, Indianapolis, Ind., and the United Motors Indianapolis Company, has joined the sales force of the Findeisen & Kropf Manufacturing Company, Chicago, maker of Rayfield carburetors.

Grant L. Egan has resigned as advertising manager of the Motor Car Equipment Company of New York City and will hereafter devote his energies to general advertising with the Catalog Publishing Company, World building, New York City.

The Miles Motor Tire Company, capitalized at $200,000, has been organized and will erect a plant at Braddock, Penn. The incorporators are: Charles W. Dressler, Thomas C. Aten, Charles L. Balyser and Zenab A. Delwarts, all of Braddock; Frederick Miles and M. R. Myers.

George L. Sullivan, recently automobile editor of the New York Tribune, has joined the sales department of the American Locomotive Company, New York City, and will be associated with Harry S. Houpt, manager of the Alco branch in that city.

The Parker Motor Wagon Company, New York City, has been incorporated for $10,000 with the following named as incorporators: Harry C. Cottfried, Drew McKenna and Charles E. Wood, 605 West 147th street, New York City.

The American Adjustable Wheel Company, Inc., Richmond, Va., was incorporated recently for $100,000 and will manufacture an adjustable motor car wheel. The officers named are: President, R. H. Bruce; vice president, Clarence Vaden; treasurer, J. H. Pinner; secretary, J. C. Davis.

The Merchants' Auto Company, Indianapolis, Ind., announces a change in its garages. The Delaware street quarters will be utilized for commercial vehicles while the repair shop and battery charging station will be located on Pratt street. E. Frank Brown has succeeded H. B. Stout, Jr., as manager.

Bosch magnetos, made by the Bosch Magneto Company, New York City, were well represented at the Olympia show, held in London, England, recently. According to the company, of the 599 magnetos shown 488 were Bosch, 81 per cent. of the total. The balance of 19 per cent. was divided among 10 other makers.

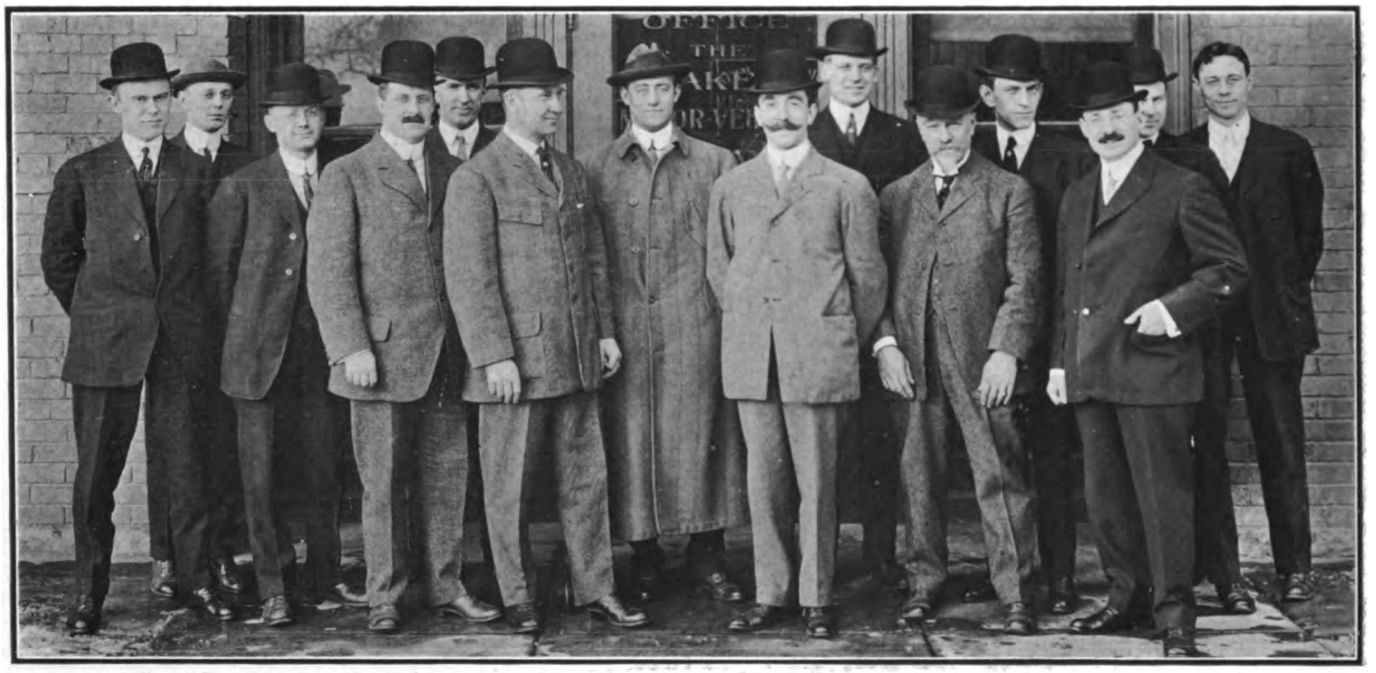
The Mack Motor Truck Company of St. Louis, Mo., has been organized and will act as distributor for the Middle West for the Mack Bros. Motor Car Company, Allentown, Penn. The officers of the new company are as follows: President, William R. Bush; vice president, Cecil G. Fennell; secretary, F. J. Bush; treasurer, Knox Tuassing.

The Virginia Automobile Garage & Repair Company, Norfolk, Va., has opened an extensive repair shop at 158 West Main street, and is prepared to handle all types of motor vehicles. The officers of the new company are as follows: President, H. L. Page; vice president and general manager, Archie M. Bopp; secretary and treasurer, P. A. Page.

The Velie Motor Vehicle Company's Chicago branch has closed a contract for the sale of Velie commercial and pleasure vehicles with the Columbia Garage, 335 West Madison street, Chicago. The latter will operate a service station for the benefit of the West Side trade, and will work in conjunction with the Chicago branch at 1615 Michigan avenue.

The Remy Electric Company, Anderson, Ind., maker of ignition and lighting devices, announces the absorption of the American Headlight Company and also has purchased outright all patents, designs, good will and manufacturing rights of the Peters Electric Headlight for steam locomotives. New buildings will be erected at Anderson to care for this production.

A White three-ton truck, made by the White Company, Cleveland, O., was one of the features of a street parade held recently in Pittsburg, Penn., to celebrate the opening of the new Sewickley bridge. The machine was attractively decorated, as indicated by the accompanying illustration. It was entered by the Joseph Horne Company. Twelve other White automobiles were represented.



Salesmen Representing the Interests of the Baker Motor Vehicle Company Who Attended Convention at the Factory of That Concern Recently.

E. P. Horton, who was recently appointed manager of the United Atlanta Company, Atlanta, Ga., southern branch of that division of the United States Motor Company, has been prominently identified with the Maxwell organization since 1904. He went to Atlanta from Syracuse, N. Y., where for the past three years he has been manager of the branch in that city.

The Baker Motor Vehicle Company of Cleveland, O., held a convention lately attended by commercial car salesmen from various parts of the country representing New York, Boston, Chicago, Buffalo and Newark, N. J. The event occupied three days, one of which was devoted to a discussion of the different problems which confront salesmen in the commercial car field and another to inspecting the factory. In the accompanying illustration is shown some of the party at the plant.

C. F. Splitdorf, New York City, maker of Splitdorf magnetos, has been making extensive alterations and changes in the branch houses of that concern throughout the country, these being necessary by the increasing business. Following new quarters in Chicago and the establishment of a branch house in Kansas City, Mo., the old location in San Francisco, Cal., has had to be abandoned owing to the lack of proper facilities. P. E. Kempton, branch manager on the coast, will be located in the future at his new headquarters, 430-36 Van Ness avenue, San Francisco.

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DISCUSSING ANTI-FRICTION BEARINGS.

Mr. Thomas Takes Exception to Some Statements Made by Authors of Previous Article--Mr. Page Makes Reply, Answering All Criticisms.

IN THE December issue of MOTOR TRUCK there appeared an interesting discussion on the use of anti-friction bearings for worm gearing by Victor W. Page, M. E., and A. F. Rockwell of the New Departure Manufacturing Company, Bristol, Conn., concerning which H. Kerr Thomas of the Pierce-Arrow Manufacturing Company, Buffalo, N. Y., appears to take some exception. Desiring that the authors of the article in question should have full opportunity to answer Mr. Thomas, his letter was forwarded to them. The entire correspondence is presented herewith, and it is believed that the readers of MOTOR TRUCK will find the continuation of the discussion quite as interesting as the original.

Editor MOTOR TRUCK,
Sir:

With reference to the interesting article on anti-friction bearings for worm gearing appearing in the December number of the MOTOR TRUCK, the author raises one or two points which, I think call for some criticism.

In the first place, he bases a number of arguments upon the statement, "The lower the pressure, the more efficient the gearing." This statement is in opposition to facts which are accepted with regard to friction. Unwin, basing his arguments on the mass of data obtained by what are known as the Beauchamp-Tower experiments of the Institution of Mechanical Engineers, clearly shows that the co-efficient of friction between two metals running in oil bath lubrication is directly proportionate to the square root of the rubbing velocity and inversely as the bearing pressure. In other words, when the bearing pressure is increased, the co-efficient of friction falls as it also does when the speed of the rubbing surfaces is decreased.

Coming to the calculations affecting loads of the gearing, I regret that I cannot follow how some of the results are obtained. The final figures with regard to the pressures on the worm teeth are much lower than anything I have ever come across. Thus the load on the worm teeth in the examples the author quotes is given as 328 pounds. This should be, in my opinion, very much higher and if the engine at 47 horsepower, which the author refers to, is exerting its full power, it should be sufficient to skid the wheels of say a fully loaded five-ton truck, and the load will be nearer to 30,000 pounds than 300 pounds.

It is possible that I have misread some of the figures in the article but as others may do the same, it appeared desirable to ask your correspondent for some further information as to how his figures are obtained.

With regard to the method of supporting the worm, the examples given in Figs. 2, 3, 4, 5, 6, and 8 in the December issue of the MOTOR TRUCK, are all undesirable. No worm gear has ever been constructed which will work without some rise in temperature and the elongation of the worm spindle with this increase will cause a very destructive effect on the ball races unless they are assembled in the first place with an amount of back lash which would be found highly objectionable. The examples given in Figs. 7 and 9 in the same issue are correct but in this respect, as the spindle is held against the thrust in either direction at one end only and is consequently free to expand as much as necessary.

I have not any experience myself with the special form of combination ball bearings described in the article but their application is exceedingly interesting. Their failure, however, would be almost a foregone conclusion if they were only provided of such strength as would be proper for the loads mentioned in the article.

I trust that some further information on the points raised may be forthcoming from the author.

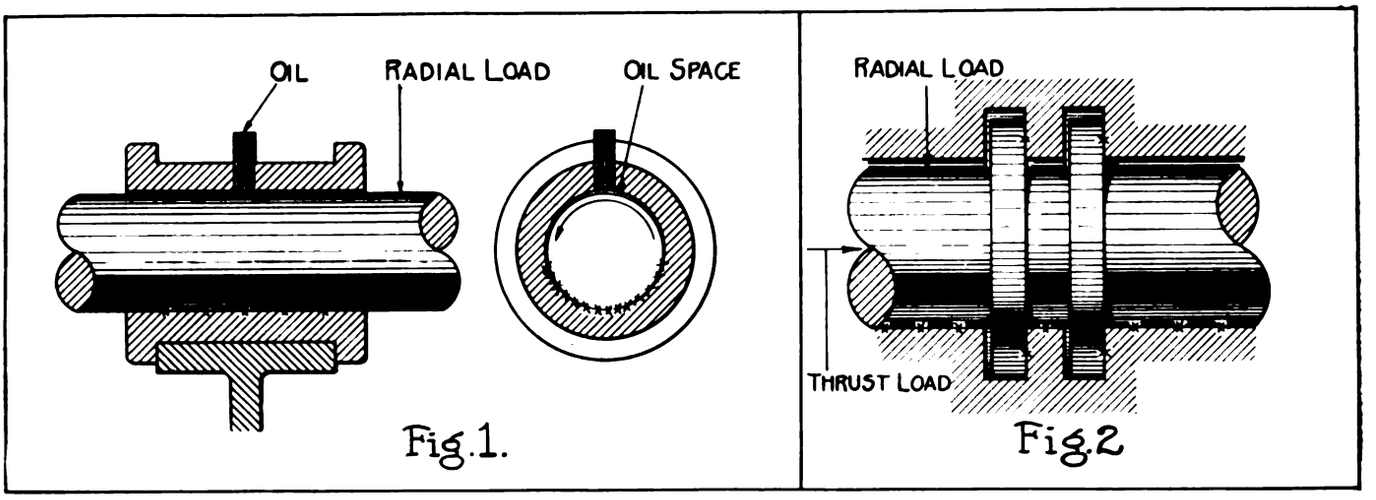
Yours truly,
H. KERR THOMAS, A. M. I. MECH. E.

Buffalo, N. Y., Dec. 19.

Editor MOTOR TRUCK.
Sir:

I beg to acknowledge receipt of your communication of recent date with enclosure and desire to thank you for giving me an opportunity to correct the erroneous impressions which are present in the mind of Mr. Thomas. I believe that a more careful reading of the article in question would have eliminated some of the criticism which Mr. Thomas offers. The statement to which he seems to take special exception is: "The lower the pressure; the more efficient the gearing and the more easily lubrication can be maintained. There is also less thrust on the bearings and consequently less power consumed by friction".

The argument which Mr. Thomas uses to support his contention is taken from data which has been accepted by many engineers and which holds true only when speaking of journals which are operating under ideal conditions as regard lubrication. If one reduces the quantity or certainty of lubrication, one will obtain radically different results, as will be evidenced by the accompanying table which was compiled from the same Beauchamp-Tower experiments in which Mr. Thomas seems to place so much reliance.



Demonstrating Different Conditions Which Prevail in Oiling Journal and Collar Bearings—Note Difficulty in Forcing Oil Film Between Surfaces of Thrust Collars Which Are Held Tightly Against Corresponding Faces of Bushing.

Oil Feed, drops per min.	Co-efficient of friction	Load, lbs. per sq. inch.
79	.008	20
82	.0054	40
80	.0053	60
83	.0063	80
98	.0077	100
84	.0083	120
90	.0093	140
84	.0113	160
	seized	260
	seized	300

Table Taken from Beauchamp-Tower Experiments with Plain Collar Thrust Bearings Which Demonstrated Gradual Friction-Coefficient Increase with Augmenting Pressure at a Rotative Speed of 128 Revolutions a Minute with Nearly Constant Lubrication.

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If the paragraph in question is read closely it will be evident that it related to thrust loads and bearings and in speaking of the efficiency of the gearing, the writer meant the entire group, including worm, worm wheel, and supporting bearings. The frictional loss for well lubricated journals must be considered from an entirely different viewpoint than that governing the action of dry, semi-dry or even surfaces between which lubrication is uncertain. It is difficult for one to define accurately where one condition begins and the other ends. The laws upon which operation of the journal bearing depend cannot be applied to those of the step or collar type which are adapted only to sustain thrust. In the well oiled journal bearing the friction resistance must obviously conform to the laws of lubricated surfaces, on the other hand if the supply of lubricant is intermittent, as the quantity of oil diminishes the resistance will tend to conform to the laws for dry or unlubricated surfaces. Another law of friction which may be recalled by Mr. Thomas relates to that existing between dry surfaces: "The friction between dry surfaces under moderate loads and low velocity increases directly as the normal pressure between them".

Between two extremes is the condition of uncertain lubrication and this is the one in which worm bearings most often run, when the worm is placed at the top of the rear axle housing. It is practically impossible to immerse it in an oil bath because if light oil is used it will run out at the ends of the axle shafts as its most common placing is directly on the rear axle. Practise seems to be about evenly divided between different engineers as to whether the worm wheels should be at the top or bottom of the axle housing. Where very large traction wheels are fitted, as is possible on the motor truck, the worm can be housed very easily under the axle as the requisite ground clearance can be obtained very readily and oil bath maintained.

The writer does not intend to take issue with Mr. Thomas' statement regarding the law of friction but at the same time it will be evident that worms can not always work under ideal conditions. In stating that "lower pressures make for greater efficiency", the writer was referring specifically to the question of maintaining an anti-friction oil film between the surfaces of the worm teeth or the thrust bearings if of the plain collar type. Careful perusal of the article under discussion will show that this was the type that the writer demonstrated would consume considerable power. If bearings of this kind are used it will be evident that high pressure tends to squeeze out oil and if the pressure is unduly high it would be difficult to maintain a sufficient supply of oil between the surfaces. If the oil film does not exist between the surfaces it will be apparent that any bearing will be practically in metallic contact with its journal. Under these conditions the co-efficient of friction would be nearly that of the dry surfaces in contact which for steel against bronze is given at .152 instead of .053 as would be the case if lubricated with light oil.

There are certain pressures at which any oil film will tend to break down and obviously, lubricant cannot be introduced between bearing surfaces if the oil film pressure is greater than that of the head of the feed. Experiments have shown that increasing the load will alter the oil pressure which falls and rises in exact proportion as the load diminishes or augments. The statement that low pressure is more desirable than high pressure between surfaces can be substantiated by common mechanical engineering practise. If the theory formulated by Mr. Thomas regarding friction reduction as pressure is augmented held good in practise it would not be necessary for machine designers to increase the size of bearings to care for bigger loads. If one wanted a practically frictionless bearing all that would be necessary would be to subject it to extremely high pressure. This might produce a condition in that a bearing which showed considerable friction under a load of 500 pounds could be practically frictionless by imposing a stress of twice or three times that amount.

Let us see how authorities look upon such hypothesis as formulated by my critic. Alford, in his book, "Bearings and Their Lubrication", says the following in regard to the friction of thrust bearings of the plain collar type: "The co-efficient of friction for a collar bearing is higher than a journal bearing running under similar conditions. In such bearings there is little or no action tending to introduce oil between surfaces as in the journal bearing. The friction co-efficient for collar bearings approaches that of a journal bearing running at low velocity and with poor lubrication. It may be taken as .04 to .05. Experimental data tends to show that the co-efficient is independent of the speed of rubbing and decreases with an increase of load." This latter bears out Mr. Thomas' statement but note how it is qualified. Again quoting Mr. Alford: "At the same time this type of bearing is only suitable for comparatively low pressure and comparatively low rotative speed unless the bearing surfaces are separated by a film of oil maintained by forced or positive feed lubrication".

The condition which actually obtains when collar type thrust bearings are used can readily be compared to those which exist when the ordinary journal bearing is employed. Referring to sketch Fig. 1, herewith, it will be seen that under a radical load, a shaft running in a plain bushing will be thrust against the bottom as indicated by the crosses. As all such bearings are fitted with a running clearance varying from .002 to .005 inch it will be evident that there exists on the unloaded side an amount of space which will permit oil to feed constantly against the bearing surfaces. The rotation of the shaft tends to carry lubricant between the surfaces in contact and thus maintain an oil film at the points where the load is applied.

Let us compare these conditions with the operation of a collar type thrust bearing as shown at Fig. 2. Here we see that under the influence of the thrust load the faces of the collars are pressed tightly against the corresponding steps in the bushing and that if the thrust is constant it is very difficult to get oil between the surfaces in contact. As soon as the oil film existing between the surfaces is used up we have an actual metal-to-metal contact and then the friction laws apply to a dry or poorly lubricated surface rather than that ideal condition quoted by Mr. Thomas. This necessitates supplying oil under pressure that would increase and insure lubrication as the load upon the bearing augmented.

If Mr. Thomas will carefully analyze the foregoing argument he will find that his criticism of the statement was not justified in as much as he attempted to apply ideal conditions where it would be difficult to duplicate them in a practical manner. Even if the steps of a collar type thrust bearing are immersed in an oil bath the thrust pressure, if sufficiently high, will tend to break down the film of oil between the surfaces in contact and it will be difficult to introduce more oil to replace that used up. If one refers to the table presented above it will be seen that with any system of lubrication which remains the same regardless of pressure existing between surfaces enough load can be applied to cause the bearings to seize. If so much depends on securing proper lubrication the writer's contention that the lower unit pressures make for increased efficiency is founded on facts.

Considering next Mr. Thomas' criticism of method of mounting the worm, the writer desires to state that the only mountings which were recommended as giving the best results were Figs. 8 and 9 in the December issue of MOTOR TRUCK. Mr. Thomas' statement regarding the expansion of the worm under heating influence of friction is well founded and it has been demonstrated that this should be compensated for by some

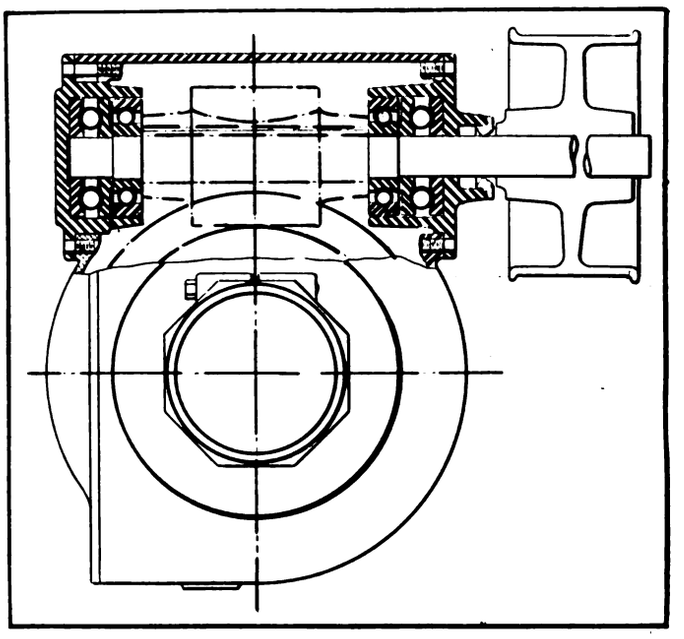


Fig. 3—Typical Design of Worm Mounting, Showing Conventional Combination of Thrust and Radial Bearings.

means. In some cases, however, the expansion due to the heating which usually obtains when properly constructed worm gearing is in operation is so slight as to be practically negligible. The mounting shown at Fig. 6 in the article previously published, which Mr. Thomas criticises, is similar to that used by a maker who has had much experience with worm drive, while that at Fig. 8 has been employed with success by the company with whom the writer is affiliated. At Fig. 3 herewith is presented a mounting taken directly from a leading engineering print and shows bearing installation in which no provision is made for worm extension.

Let us consider more closely what the actual expansion would be. Assume that we had a steel worm one foot in length and that friction would produce a rise in temperature of 200 degrees Fahrenheit, which is somewhat higher than would be desirable to have exist as it approaches the maximum degree of heat at which even perfectly lubricated bearings will run with any success. Take the co-efficient of linear expansion of steel to be .0000063 inch an inch length a degree Fahrenheit. This would indicate a total expansion of .01 inch, or about .005 inch extension each side of centre line. This condition can only exist assuming there is a difference of temperature of 200 degrees between the gear and the housing and the bearings. It is safe to assume that if there is any heating in the gearing the containing case would also rise in temperature and that the bearings and their retaining members would become hotter and expand proportionately as the worm increases in temperature; in fact, if the case were of bronze, it would expand faster than the steel worm as the co-efficient of linear expansion for that material is .0000098 inch an inch length a degree Fahrenheit.

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In view of what has been demonstrated it would seem that the mounting of double row bearings described in the criticised article is not wrong and there can be but little question about their desirability. It has been shown that while worm expansion under ordinary conditions is slight it would be well to make provision for some slight degree of increase in unit length of the worm shaft. This can be done very satisfactorily by using the mounting suggested at Fig. 9. Even in the case of Fig. 8, where two double row bearings are used, one at each end of the worm shaft, it will be evident that with a maximum clearance space or "float" of .005 inch or even double that amount between the clamping nut and the bearing at each end there could not exist any play or lost motion between the bearing parts because it is a unit construction. Under this condition of mounting any increase in length due to worm expansion would be easily taken care of.

Another criticism which Mr. Thomas makes is that he cannot follow fully the line of reasoning which shows end thrust pressure lower than his guess of the load that exists on the worm teeth, which he places at the moderate (?) amount of 30,000 pounds. With reference to this the writer can only say that the formulae have been taken from standard authorities and as values are given and the equations worked out it would seem that any one could follow same without a burdensome expenditure of thought.

Mr. Thomas assures the writer that while he has had no experience with the bearings under discussion he feels that they would surely fail if selected with reference to the loads mentioned in the article. Let us see how this works out by considering some typical bearings which would be adequate to resist the end thrust loads believed to exist by the writer. Take the maximum thrust load stated or 1200 pounds which is given when the gearing is in the reverse ratio and the full horsepower of the motor minus the inevitable loss in the gears of the change speed mechanism is being delivered to the worm. If one selects a collar bearing of the ball type from standard tables to resist this load at 250 revolutions a minute, one will find it necessary to use a bearing of 1.75 inches bore, using 11 .75-inch balls and having an outside diameter of four inches. When it is realized that this bearing is suitable only to take thrust and that it must be used in connection with a single row bearing it will be seen that this makes quite a practical size. A radial bearing suitable for use in connection with the bearing mentioned would be about a No. 1309 which has a bore of 1.7716 inches (45 mm) and an outside diameter of 3.937 or 100 mm which will have adequate capacity for the maximum radial loads because two such combinations of bearings will be necessary, one at each end of the worm. It will be evident that the load rating as given by the writer is that assumed to be present when the truck is being run on the reverse ratio, a maximum value. When selecting a New Departure double row bearing it will be found desirable to use a No. 311 at least. This would have a bore of 2.1653 inches or 55 mm and an outside diameter of 4.7244 inches or 120 mm. Obviously any main drive shaft two inches in diameter will transmit 40 horsepower without much danger of rupture. Assuming that in truck work one would prefer a bearing of the heavy series, a No. 411 which has the same bore as the No. 311, but uses larger balls and which calls for a housing having a bore of 5.5118 inches or 140 mm, could be utilized to advantage. This would provide a factor of safety that would be desirable.

At the other hand let us consider the thrust load at 30,000 pounds, which Mr. Thomas evidently believes to exist, according to his own statement, and figure a bearing size to resist same by using standard formula. One will find that a collar thrust bearing about seven inches bore, 18 inches in diameter and having nine 3.5-inch diameter balls would be just about suitable to sustain 30,000 pounds at 250 revolutions a minute. When one considers that Mr. Thomas' guess regarding load is compared to that determined by the writer to exist at 1000 revolutions a minute or while the truck is in direct drive it is evident that a thrust bearing of the ball collar type adequate to resist 30,000 pounds thrust at 1000 revolutions a minute would be of such size to tax the ingenuity of a designing engineer, to install at any other point except the load carrying platform of the truck under discussion.

If Mr. Thomas prefers plain thrust bearings of the collar type, which by his own statement, have less friction and consequently longer life the more load one puts on them, he will find, assuming a maximum permissible load of 300 pounds a square inch projected bearing area, that it would take collars having an area of at least 100 square inches to resist a thrust of 30,000 pounds. Taking a typical example to show the absurdity of such a statement it would mean providing a series of five eight-inch diameter collars on a six-inch shaft.

The writer feels that a little intelligent use of pencil and paper and reference to a few formulae and tables readily accessible to any one of an inquiring nature would have saved Mr. Thomas making some statements regarding loads or friction which are founded on so little reflection that, obviously, further comment would be superfluous. The writer desires to thank Mr. Thomas for his criticisms of the article, but feels that when the article is reread with the view of securing an intelligent understanding of the statements made therein, the exceptions cannot be upheld.

I await with some degree of interest a criticism and analysis of the formula presented to show that my statement of loads existing under the conditions stated are radically wrong. In this connection it would be well to state these are only approximations and may vary by small amounts from stresses which will actually exist at the point specified. Trusting that you will find space enough to publish this somewhat lengthy exposition which should answer Mr. Thomas' criticisms fully enough so he may obtain a better understanding of the subject under discussion, I beg to remain,

Yours very truly,

VICTOR W. PAGE, M. E.

Bristol, Conn., Dec. 26.

CALENDAR OF COMING EVENTS.

January, 1912.

(New York Shows)

Jan. 2-9 —Importers' Salon, Hotel Astor.
Jan. 6-13 —Pleasure cars, Madison Square Garden.
Jan. 10-17—N. A. A. M., Grand Central Palace.
Jan. 15-20—Commercial cars, Madison Square Garden.

Jan. 8-13—Show, Peoria, Ill.
Jan. 13-19—Show, Milwaukee, Wis.
Jan. 13-20—Pleasure car show, Philadelphia, Penn.
Jan. 15-20—Show, Toledo, O.
Jan. 15-20—Show, St. Paul, Minn.
Jan. 18-20—Annual meeting S. A. E., New York.
Jan. 22-27—Commercial car show, Philadelphia, Penn.
Jan. 22-27—Show, Detroit, Mich.
Jan. 22-27—Show, Rochester, N. Y.
Jan. 22-27—Show, Dubuque, Ia.
Jan. 22-28—Show, Providence, R. I.
Jan. 27-Feb. 3—Pleasure car show, Chicago, Ill.
Jan. 27-Feb. 3—Pleasure car show, Pittsburg, Penn.
Jan. 29-Feb. 3—Show, Scranton, Penn.
Jan. 29-Feb. 3—Dealers' show, Minneapolis, Minn.
Jan. 29-Feb. 3—Show, Montgomery, Ala.

February.

Feb. 1- 7—Show, Washington, D. C.
Feb. 3-10—National show, Montreal, Can.
Feb. 3-10—Show, Harrisburg, Penn.
Feb. 5-10—Commercial car show, Chicago, Ill.
Feb. 5-10—Commercial car show, Pittsburg, Penn.
Feb. 5-10—Pleasure car show, St. Louis, Mo.
Feb. 5-10—Show, Buffalo, N. Y.
Feb. 10-17—Show, Atlanta, Ga.
Feb. 12-17—Commercial car show, St. Louis, Mo.
Feb. 12-17—Show, Memphis, Tenn.
Feb. 12-17—Show, Ottawa, Can.
Feb. 12-17—Show, Fall River, Mass.
Feb. 12-17—Show, Kansas City, Mo.
Feb. 12-19—Show, Dayton, O.
Feb. 14-17—Show, Grand Rapids, Mich.
Feb. 17-24—Exposition show, Pittsburg, Penn.
Feb. 17-24—Association show, Minneapolis, Minn.
Feb. 17-24—Show, Newark, N. J.
Feb. 17-24—Show, Cleveland, O.
Feb. 19-24—Show, Omaha, Neb.
Feb. 19-24—Show, Hartford, Conn.
Feb. 19-24—Show, Cincinnati, O.
Feb. 20-24—Show, Binghamton, N. Y.
Feb. 20-28—Show, Baltimore, Md.
Feb. 21-24—Show, Louisville, Ky.
Feb. 21-28—Show, Toronto, Can.
Feb. 24-March 2—Show, Brooklyn, N. Y.
Feb. 26-March 2—Show, Paterson, N. J.
Feb. 26-March 2—Show, Elmira, N. Y.
Feb. 28-March 2—Show, Davenport, Ia.

March.

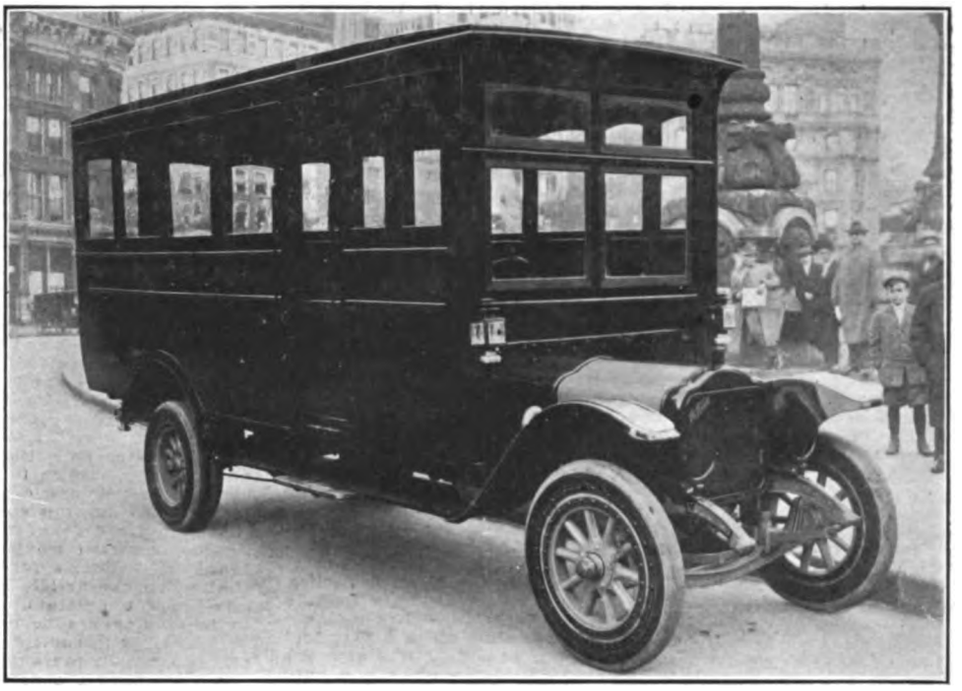
March 2-9 —Show, Norfolk, Va.
March 2-9 —Pleasure car show, Boston, Mass.
March 4-9 —Show, Des Moines, Ia.
March 4-10—Show, Denver, Col.
March 6-9 —Show, Tiffin, O.
March 12-16—Show, Syracuse, N. Y.
March 13-20—Commercial car show, Boston, Mass.

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MANY CITIES ADOPT WHITE 'BUSES.

That there is a growing tendency to adopt motor propelled omnibuses is evidenced by the announcement that Indianapolis, Ind., has opened a line of machines and that a company has been formed in Kenosha, Wis., for a similar purpose. In the former city the Rapid Transit Company has placed in service several vehicles of the same type as utilized by a Chicago concern. These are the product of the White Company, Cleveland, O., and the chassis is of the 1.5-ton class. These machines seat 18 people and all are of the pay-as-you-enter type. They are fitted with electric fans for summer and a heating system is employed in the winter. The seats are luxuriously upholstered and the interior of the car is lighted by electric dome lamps.

In the accompanying illustration is presented one of the automobiles which is proving a great convenience to the residents of Meridian street, Indianapolis, over which thoroughfare the operation of street car lines is not permitted. There are many fine residences on this street and the residents are obliged either to walk or use their own vehicles. The 'buses will operate over a territory within 3.5 miles of the "circle," the centre of the city. The cash fare charged is 10 cents or four tickets for 25 cents, 10 for 50 and 21 for $1. The company behind the enterprise has ample capital and intends to establish more White cars for service in various parts of the city.



Type of White Pay-as-You-Enter Motor 'Bus Adopted by Transit Lines Established in Several Large Cities.

The Kenosha corporation, which will utilize White vehicles to supplant the service of the Kenosha Railway, has decided upon the following schedule: Ten cents for a single trip over the entire line now mapped out. Ten tickets will be sold for 75 cents and 50 for $2.50.

SPLENDID TIRE MILEAGE.

J. J. Boobar, secretary of the Terminal Taxicab Company, Washington, D. C., writes enthusiastically concerning a 34 by four-inch Republic tire, made by the Republic Rubber Company, Youngstown, O., which recently was taken from one of its cars. This shoe was fitted to a machine weighing 2800 pounds and was operated 9744 miles on the left rear wheel before being shifted to the right front wheel for 576, a total of 10,320 miles. From the time it was installed, June 24, 1910, until it was discarded, Oct. 1, 1911, it was removed only once for repairs, May 30, 1911, when an inside fabric patch was applied at a cost of $1.80. This tire cost the company less than four mills a mile of service.

SALOM BATTERY WINS.

In competition with three other makes of storage batteries a Salom, made by the Niagara Lead & Battery Company, Niagara Falls, N. Y., won out in a trial for electric lighting the 105 taxicabs of the Taxi Service Company, Boston, Mass., recently. The average time of the test for four cars on two side and meter lights, making 14 candlepower in all, was 60 hours. The contract was made with the Salom Battery Company of New England, Boston, Mass.

TRUCKS AT MILWAUKEE SHOW.

The committee in charge of the show of the Milwaukee Automobile Dealers' Association in the Auditorium, Milwaukee, Wis., Jan. 13-20, has spared no pains to make the commercial vehicle division even more attractive than that section devoted to pleasure cars. The event is in charge of F. J. Edwards as chairman of the committee, and B. J. Ruddle as manager. Among the exhibitors of business automobiles will be the following:

Buick Motor Company, American Automobile Company, Hickman-Lauson-Diener Company, Kissel-Kar Company, Curtis Automobile Company, Bates-Odenbrett Automobile Company, Packard Motor Car Company, Johnson Service Company, Orin R. Hughes, Brodesser Motor Truck Company, American Locomotive Company, Crown Commercial Car Company, McDuffee Auto Company, Stegeman Motor Car Company, B. F. Power Company, and Universal Machinery Company.

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The MOTOR TRUCK
Devoted to Motor Driven Business Vehicles of All Classes.

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TWO BIG SHOWS IN NEW YORK CITY.

Madison Square Garden and Grand Central Palace Displays Reveal Much Progress—Trend of Design Is Toward Accessibility, Economy of Operation and Refinement—Splendid Business Results at Both Exhibitions.

PROGRESS in motor truck construction evidently is to be a matter of strengthening those features which may be regarded more or less as standard, rather than in radical departures from established design. This applies more particularly to the mechanical details, since it seems to be settled that the working out of body problems must be along individual lines. There are a few things, concerning which designers and constructors may be expected to disagree for all time, and no doubt this difference of opinion will extend to the purchaser and user as well. Much that has been determined in the pleasure car field has been adopted and enlarged upon in the industrial transport of today. Taking the subject as a whole, it was not to be expected that the national commercial vehicle shows in New York City would disclose any great number of features which were decidedly new.

A year ago business vehicles, or freight automobiles, were called specifically to the attention of the public for the first time in a separate show. The production of this line was regarded as in its infancy at the time, and some doubt was expressed as to the wisdom of the departure. But despite the fact that the importance of this branch of the industry was somewhat under-estimated, the display in 1911 was sufficient to indicate that much progress had been made.



Main Floor of Madison Square Garden During Second Annual Exclusive Commercial Vehicle Display.

Compared with the product on view a year ago, the industry has made rapid strides during the twelvemonth. Several new vehicles were shown for the first time, some of these being manufactured by concerns which have long been associated with the pleasure car line; others were new models brought out this season by well known truck makers, while still others were absolutely new, their sponsors never having made display in either field previously. It may be stated at the outset that the mechanical construction was uniformly superior to that of 1911, greater attention having been paid to so-called minor details; matters of design, workmanship and finish. This applies to the two exhibits as a whole, and not in any individual sense.

Having special reference to the chassis: Two or three features stand out rather distinctly, as indicating the trend of design. Accessibility to the power plant, carrying with it the location of driver, may be regarded by some as of greatest importance. The fitting of a governor, thereby taking the matter of speed regulation beyond a certain point, out of the hands of the operator, evidently has been so considered by many makers. But from the standpoint of the purchaser who desires to utilize trucks in fleets, replacing his horse drawn equipment entirely, the provision for the substitution of an extra power plant has a most direct appeal. The latter feature may be regarded as the chief innovation at the shows, albeit the designs of those on display were made public some months since.

It is well known that concerns which must depend upon horses for their delivery systems or haulage work are required to keep a number of extra animals in order that there shall be no loss of efficiency because of indisposition or death. One well known department store in New York City considers it necessary to keep a ratio of seven horses in order to be certain of the use of six. This percentage may be accepted as an average, although it may be regarded as too large in some cases and too small in others. But whatever the number of extra animals, they must be fed and housed as well when not working as when employed; an ever present source of expense.

With this latest plan of the truck maker, the owner of a fleet of commercial motor vehicles simply buys an extra power plant, which can be slipped into place instead of the disabled motor within a few minutes, hardly more than it would take to change horses, and the garage attendant is free to make necessary repairs while the truck continues

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its work. The advantages are obvious. There is no delay in the delivery system, and the extra horse, if it may be so termed, eats nothing—costs nothing—while it is awaiting its turn to be useful.

This is accomplished in a number of ways, as always has been true. But special reference is made here to the simplification of the removal and replacement evidenced by the latest designs of some of the makers. These methods will be described in detail in connection with the review of the various exhibits on the succeeding pages. And it may be added the feature is confined to the power plant, but includes transmission units, etc.

In the matter of motor location, opinions still continue to be divided. It is possible that the advocates of the driver over the engine have gained ground slightly. Some of the older and best known firms still retain the hood, but it is noticeable that even with these there is a tendency toward the so-called Continental method in larger sizes. The makers of the Lozier, Locomobile and Pope-Hartford, three established pleasure car concerns which have announced trucks this season, have decided upon the under-the-floor design. In its new six-ton model Knox has gone a step further and placed the driver beside the motor in the cab, after the plan adopted by Morgan, Hewitt and Garford. Another feature which may be regarded as a trend of design is the location of the operating levers. Many concerns which still retain the right hand drive for pleasure cars are producing commercial vehicles with left hand location for the driver. In some instances this means that the levers are in the centre, while in others a left hand position is provided for these as well.

Some type of governor is fitted with a large number of makes. This is a new departure, insofar as the shows are concerned, as very few manufacturers had decided upon this a year ago. Self-starting devices also are beginning to make their appearance although their use is not sufficiently general to make it appear that their need has been entirely proven. It will be surprising, however, if the number were not increased materially during the coming year, as it is known that several makers are working on devices of their own design.



Splendid Setting in New Grand Central Palace, Where Trucks Shared Interest with Pleasure Cars.

Many of the new machines present features which may be regarded as novel and distinctive. This holds true particularly of transmissions, a number of which must be considered as entirely new although they have been given sufficient test by the makers to warrant their appearance in the market. Last year, the Pierce-Arrow appeared with a worm and worm wheel drive, and the list has been increased by the addition of the Newark and Rowe, although the latter was not shown. Other minor changes will be illustrated and described herein.

All told, there were 72 different makes of commercial vehicles represented in the two displays; 35 at Madison Square Garden and 37 at the Grand Central Palace. Of the 72, 12 were operated by electricity, nine of these being shown at the Garden and three at the Palace. Two hundred and forty-two complete vehicles and chassis were displayed, divided as follows: Garden—Gasoline, 100; electric, 35. Palace—Gasoline, 95; electric, seven.

Of the gasoline vehicles and chassis displayed at the Madison Square Garden, six were equipped with single-cylinder motors, 19 with two, and 75 with four. At the Grand Central Palace, there were eight having two-cylinder, four-cycle motors; nine with two-cylinder, two-cycle; nine with three-cylinder, two-cycle, and 62 with four-cylinder, four-cycle.

In the matter of cooling, it was noticeable that in a few instances those employing air had discarded the system for water, although a number of the new vehicles had selected the air-cooled motor. None of this type was shown at the Garden, while 16 vehicles and chassis displayed air-cooled engines at the Palace. This means there were six makes thus represented.

It has been mentioned herein that body designs are largely a matter of individual application. Naturally, they played a decidedly important part in the display. A visitor at the show might gain the impression at first that the industry was seeking to secure a large share of the brewery and coal business, although, of course, the delivery and general utility wagons far outnumbered the special designs. It is true, however, that brewery wagons and coal dumpers were to be seen at a number of spaces, and some really ingenious devices were included among the latter.

The succeeding pages contain a somewhat detailed description of the various exhibits, affording opportunity to discuss the new features, both in chassis and body design. Where new models were shown, it has been deemed best to include features which may not be regarded as especially new, in order that the reader may become more or less familiar with the constructional details of these products.

With respect to the attendance, it is announced that nearly 70,000 people visited the Madison Square Garden during the week devoted to the display of industrial transports. Inasmuch as commercial and pleasure vehicles were shown together at the Grand Central Palace, it is impossible to determine the exact number interested in trucks with the same degree of accuracy. Exhibitors at both displays declare that the business transacted was far ahead of that accomplished along this line a year ago.

Owing no doubt to the fact that fewer municipal service wagons were exhibited this year, there was decided decrease in the number of city officials who attended the show. Their places were taken by a largely increased list of farmers, and it was interesting to note how well informed these tillers of the soil were, when it came to discussing mechanical features of the various cars on display.

Business men in all walks of life were well represented. And with these it is stated that there was a closer investigation of mechanical construction than ever before, although most of them were deeply interested in the body problem. In nearly every case it was found that the inquirer was prepared to buy, providing he could find that which best suited his needs. More real sales and more good prospects than last year, was the chief result of the shows.

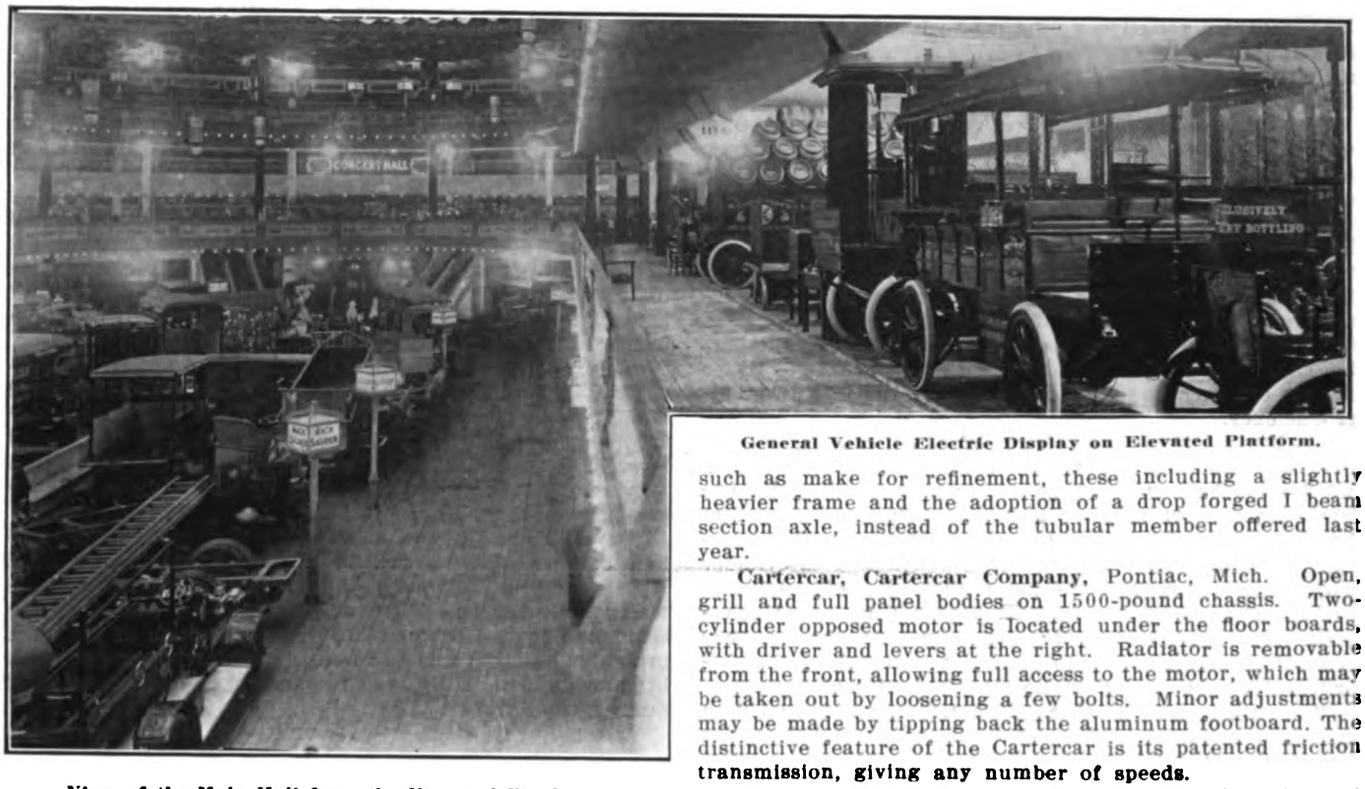
As is well known, an effort will be made in 1913 to combine all makes of commercial vehicles in one exhibit, providing a suitable building can be secured, and there is little doubt that this plan will meet with the approval of the manufacturers.

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EXHIBITS AT THE MADISON SQUARE GARDEN.

WITH exactly the same decorative scheme as that which pleased thousands at the pleasure car show in Madison Square Garden, New York City, the previous week, the commercial vehicle manufacturers held their second exclusive display in that historic structure, Jan. 15-20. The event was under the auspices of the Automobile Board of Trade and the management of the following show committee: Col. George Pope, Col. Charles Clifton, Alfred Reeves and Merle L. Downs.

In the review of the exhibits below, it will be noted that the makes of machines are offered in alphabetical order, followed by the name and address of the manufacturer, and the vehicles and chassis on display. No attempt has been made to discuss the offerings of the accessory exhibitors, it being deemed best to reserve this for a succeeding issue. It may be stated, however, that there were 181 representatives of this character, all located on the upper floors, the basement being closed for the second week, and that their share of business was much more satisfactory than was true during the commercial vehicle show of 1911.



View of the Main Hall from the Elevated Platform.

Alco, American Locomotive Company, New York City and Providence, R. I. Two-ton bottled beer wagon, 3.5-ton chassis, five-ton coal dumper. In these the motor is located under the floor boards with the driver and levers at the right. Accessibility is afforded by removing two long side plates, or by lifting the floor boards. As a feature of refinement, making for economy on tires, it is pointed out that the service brake cannot lock the wheels until the speed of the truck has been reduced to two miles an hour. Governors are fitted on all models.

The two-ton chassis is claimed to be 25 per cent. lighter than previous constructions. The body shown was of all metal, and provided with entrances at the side and rear. The capacity was 72 boxes of bottled beer. The dumping body also was of metal, and arranged so as to dump at the side. The hoist was operated on two standards with a succession of gears and by hand crank.

Autocar, Autocar Company, Ardmore, Penn. Chassis, station 'bus, furniture van, casket wagon, enclosed delivery, wire grill, stake and open passenger 'bus; all of 1.5-ton capacity. The motor is under the floor, with driver at the right, and right hand levers. Accessibility is obtained by folding the seat and floor boards in an upright position. No particularly new features were disclosed, the same two-cylinder opposed motor and patented double reduction final drive being retained.

Of the body designs special attention was called to the open passenger 'bus, seating 14 besides the driver. The seats run crosswise, and enclosed doors are fitted on the right side.

Brush, Brush Runabout Company, Detroit. Seven hundred-pound chassis and two panel delivery wagons of the same capacity. Motor is in front under a hood, and driver at the left with left hand levers. No new features were presented, the single-cylinder engine with auxiliary balancing device being retained, as well as the unique spiral spring suspension.

Buick, Buick Motor Company, Flint, Mich. Eight different types of bodies on one-ton chassis. Two-cylinder opposed motor is located under the floor boards, with driver and levers at the right. The only changes are

General Vehicle Electric Display on Elevated Platform.

such as make for refinement, these including a slightly heavier frame and the adoption of a drop forged I beam section axle, instead of the tubular member offered last year.

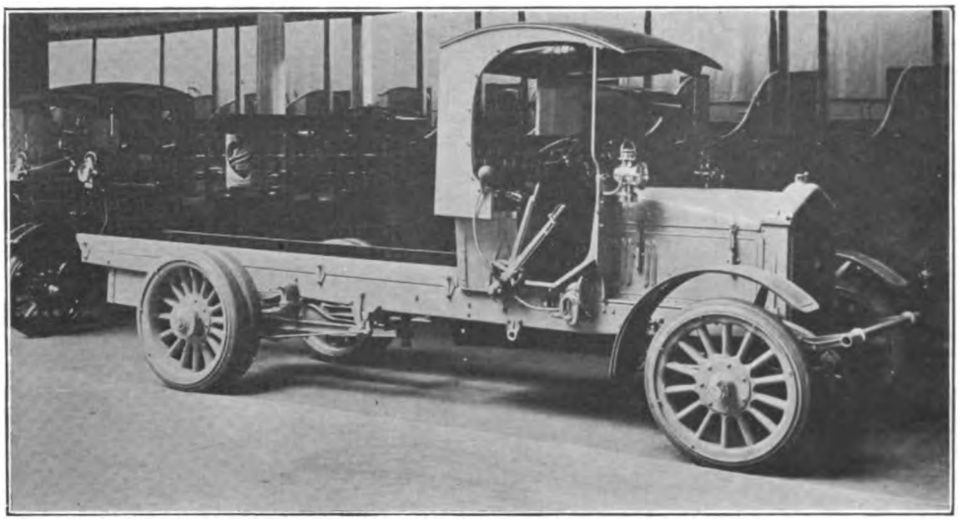
Cartercar, Cartercar Company, Pontiac, Mich. Open, grill and full panel bodies on 1500-pound chassis. Two-cylinder opposed motor is located under the floor boards, with driver and levers at the right. Radiator is removable from the front, allowing full access to the motor, which may be taken out by loosening a few bolts. Minor adjustments may be made by tipping back the aluminum footboard. The distinctive feature of the Cartercar is its patented friction transmission, giving any number of speeds.

Flanders, E-M-F Company, Detroit. Chassis and panel delivery wagon, each of 750 pounds capacity. Motor is located in front under a hood, and the driver is at the right, with right hand levers. This may be regarded as a new product of the Studebaker Corporation, and the chassis is similar in every respect to that of the well known 20 horsepower pleasure car, except that it has been strengthened at a number of points to adapt it for light delivery work.

Garford, Garford Company, Elyria, O. Chassis, wholesale milk wagon, wholesale grocery wagon, brewery barrel wagon, all of five tons capacity, and 1.5-ton public service delivery. In the smaller vehicle the motor is located in front under a hood, but in the larger it is in the cab beside the driver. Operator is located at the right with hand levers. Radiator may be removed and the motor dismounted through the front. Minor adjustments in the larger car may be made without leaving the cab.

The five-ton Garford is an entirely new model, and the 1.5 and three-ton, the latter of which was not shown, have been changed sufficiently to make them new as well. Heretofore, Garford trucks have utilized a friction transmission, and it is understood that the older models still may be had

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Worm Driven Pierce-Arrow Was a Distinctive Feature of the Show.

with this upon special order. However, the new specifications include a selective sliding gear with three speeds forward and a reverse. Drive is by jackshaft and double chains to the rear axle. Other changes have been made to correspond with the difference in transmission.

G. M. C., General Motors Truck Company, Detroit. One, two and three-ton stake, two-ton delivery, 3.5-ton chassis and furniture van, and five-ton brewery wagon. This line really is a combination of the old Reliance and Rapid, both of which retain their essential characteristics, although the design has been modified slightly. The models heretofore known as Reliance are made in the two, 3.5 and five-ton sizes, and the motor is mounted on a sub-frame attached at three points to the main chassis frame. The Rapid is continued as one, two and three-ton vehicles, minus the chain cases and equipped with a governor. Other changes are such as are intended to give the machines better efficiency.

Grabowsky, Grabowsky Power Wagon Company, Detroit. One-ton piano wagon, three-ton chassis and furniture van, and five-ton brewery wagon. Motor is partially under the floor with a short radiator in front. Driver is located at the right with right hand levers. Several changes in design are noted, among them being the new four-cylinder vertical motor, replacing the two-cylinder opposed engine of former years, and the substitution of a three-speed selectively operated gearset for the planetary change gear mechanism. Other features include a governor of the butterfly valve type in the intake manifold and self-starter.

The motor, transmission and clutch are mounted as a unit on a sub-frame, which is removable bodily from the chassis through the front. The short hood is hinged at the top, and the front cross bar at the left. These being opened, the power plant unit is so arranged that it slides in and out like a drawer. A wooden horse, on which is mounted a pair of rails registering with those carrying the motor in the chassis, is rolled into place and the work of removal thus becomes a most simple matter.

Hewitt, Hewitt Motor Company, New York City. Three chassis, of one, 3.5 and 10 tons capacity, respectively, and seven-ton brewery wagon. Motor is either under the floor or beside the driver in the cab, and the operator is placed either at the right or left with levers, accordingly. Several other models are made but not shown. Some retain the two-cylinder opposed motor; some are supplied with selective sliding gear transmission and others with the planetary type.

As was true at last year's show, the 10-ton Hewitt was the largest vehicle on display. This is one of the models with a planetary gearbox. The chassis was shown beside that of the one-ton, still further accentuating its size. The entire line offers little that is new in mechanical construction, it being claimed that the various features have proven decidedly satisfactory in service for a number of years.

Knox, Knox Automobile Company, Springfield, Mass. Two-ton delivery wagon, five-ton wholesale fruit wagon, six-ton chassis, gasoline driven pumping engine. Motor is located under the floor in the two smaller sized trucks, while in the six-ton vehicle it is beside the driver in the cab. Operator and levers are at the right.

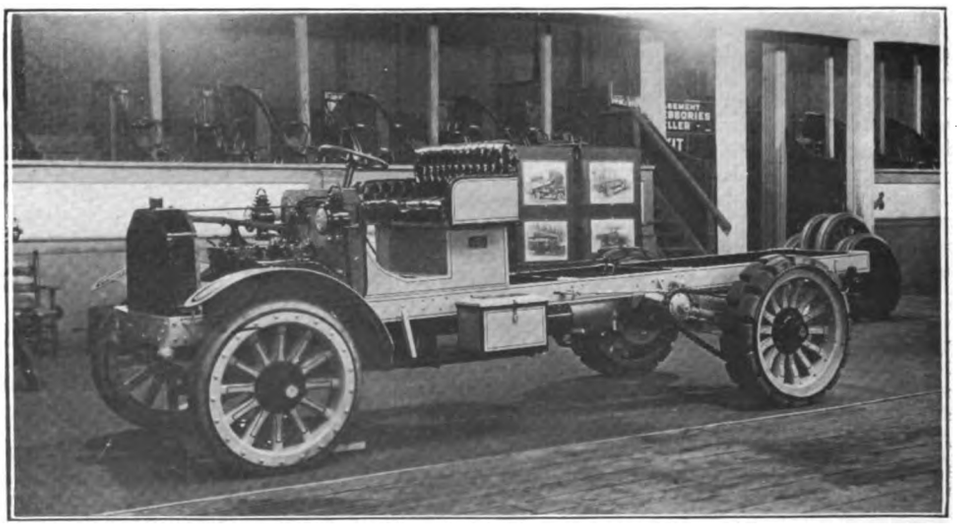
The six-ton machine is a new model, although it does not differ materially from the five, except in the heavier construction. The principal distinguishing feature is the location of the motor in the cab, following the practise adopted by Garford, Hewitt and Morgan. Governors are fitted to all models this year.

The pumping engine, which was seen for the first time at the 1911 show, has been changed slightly, as subsequent tests have revealed the desirability. The pump is of the double-acting two-piston type, and the single chain drive of last year has been replaced by two chains. The motor is a six-cylinder unit, rated at 60 horsepower. The pumping capacity is 600 gallons of water a minute.

Locomobile, Locomobile Company of America, Bridgeport, Conn. Five-ton chassis, and combination chemical and hose wagon. In the truck, the motor is placed under the floor boards, with driver at the right and right hand levers. Accessibility is afforded by tilting the seat backward, and minor adjustments may be made by the removal of side panels.

Inasmuch as this is an entirely new model, produced by a concern which is well known in the pleasure car field, it will prove of interest to give a brief description of its mechanical details. First, it ought to be said that the company does not contemplate the construction of bodies at present, although it is understood that arrangements have been made with a Bridgeport concern to do this work if desired.

The motor is a four-cylinder unit, with bore of five inches



Peerless Line Was Represented by One Five-Ton Chassis Only.

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and stroke of six, water-cooled and rated at 45 horsepower at 900 revolutions, to which speed it is restricted by a governor of the vertical ring type. The crankcase is of bronze; the valves are large and equipped with quiet valve lifters, and the crankshaft is of alloy steel carried on five large bearings.

The carburetor is of the float feed type with single jet, a Locomobile design. Mixture is controlled from the seat. Ignition is by high-tension magneto and storage battery. Cooling is by means of a honeycomb radiator with gear driven centrifugal pump, the former being protected by channel cross members and supported on one-inch rubber blocks. Lubrication is by a self-contained system for the motor, a gear driven pump forcing oil to all bearings in a constant stream. Grease cups are fitted at all wearing points on the chassis.

The transmission is a four-speed selective type with a bronze gearcase. Clutch is of the dry disc type; 14 special steel discs, seven of them being lined on both sides with non-burn material. Drive is by double chain. Springs are semi-elliptical, 42 inches long in front and 50 in the rear. The latter are shackled at both ends. A transverse jack spring is fitted to absorb all road shocks.

Front axle is a solid forging of the I beam section, and pivots have roller thrust bearings to reduce friction. The rear member is a rectangular section forging of alloy steel. Emergency brakes expand on sprocket drum bolted to the rear axle and the service members contract on a drum on the jackshaft to which front sprockets are bolted. Wheels are of cast steel, 40 inches in diameter, with roller bearings front and rear. Wheelbase is 140 inches, tires 40 by six inches, single in front and dual in rear.

The fire wagon shown did not differ materially from those which have been displayed by this concern previously. A slightly longer wheelbase and a special form of rear axle, somewhat heavier in construction, were the principal features noted.

Lozier, Lozier Motor Company, Detroit. Five-ton chassis. Motor is located under the floor boards, with driver and levers at the right. Motor, transmission and driver's seat are mounted on a sub-frame, which is supported by springs, independently of the frame and springs of the chassis itself. Accessibility is afforded by lifting the floor boards and turning the seat out of the way, or these may be entirely removed and the power plant exposed for thorough inspection. The sub-frame is hinged at the rear end to a cross frame member, while the forward end rests on independent auxiliary springs. The removal of four bolts in front and two in the rear enables the entire power plant, consisting of motor, cooler, clutch, transmission, steering wheel and driver's seat, to be taken from the chassis.

This also is a new model, produced by a well known pleasure car maker. The four-cylinder motor has a bore of 4.25 inches and stroke of 6.5, water-cooled, and rated at 35 horsepower at 900 revolutions, maximum torque being developed at this speed. The cylinders are offset, and the crankshaft mounted on annular ball bearings. Valves are of nickel alloy, and are all located on one side. Camshafts are driven by silent chains in an oil tight case, following the latest European practise.

A governor operated on a valve in the inlet manifold separate from the carburetor, permits the operator to remove the vaporizer without disturbing the governing mechanism. Carburetion is by a Lozier device located on the left side, while ignition is by Bosch magneto, placed on the right, and storage battery.

Lubrication is a combination of splash and force feed, the splash level being adjustable from the front end of the motor case. Oil is taken from the bottom of the crankcase by a gear driven pump and distributed to the bearings and splash pockets, overflowing into the oil cellar through a strainer.

The transmission and jackshaft are made up of two separate units, the former being of the selective sliding gear type, with four speeds forward and reverse. Clutch is of the standard Lozier design with 28 hardened saw blade steel discs enclosed in an oil tight flywheel case. Power is transmitted from the clutch to the transmission through a double universal joint of the block type, made of high carbon steel, hardened and ground, and enclosed in a metallic dust proof oil case.

Service brakes are mounted on the jackshaft and are of the contracting band type, 14 inches in diameter by 2.5 in width. Emergency members are of the internal expanding type enclosed in the rear wheel drum, 18 inches in diameter and with four-inch faces. The wheelbase is 134 inches. The centre of gravity is forward of the rear axle, increasing the load on the front wheels as the truck load is increased.

Front and rear axles are drop forgings from high carbon, heat treated, open hearth steel, and of rectangular section. On the front members the spring pads are carried below the centre of the wheel, the axle having a drop of five inches, allowing the lower half of the motor case to be removed without interfering with the axle. This also permits the engine to be placed sufficiently low in the subframe to give practically a straight line drive.

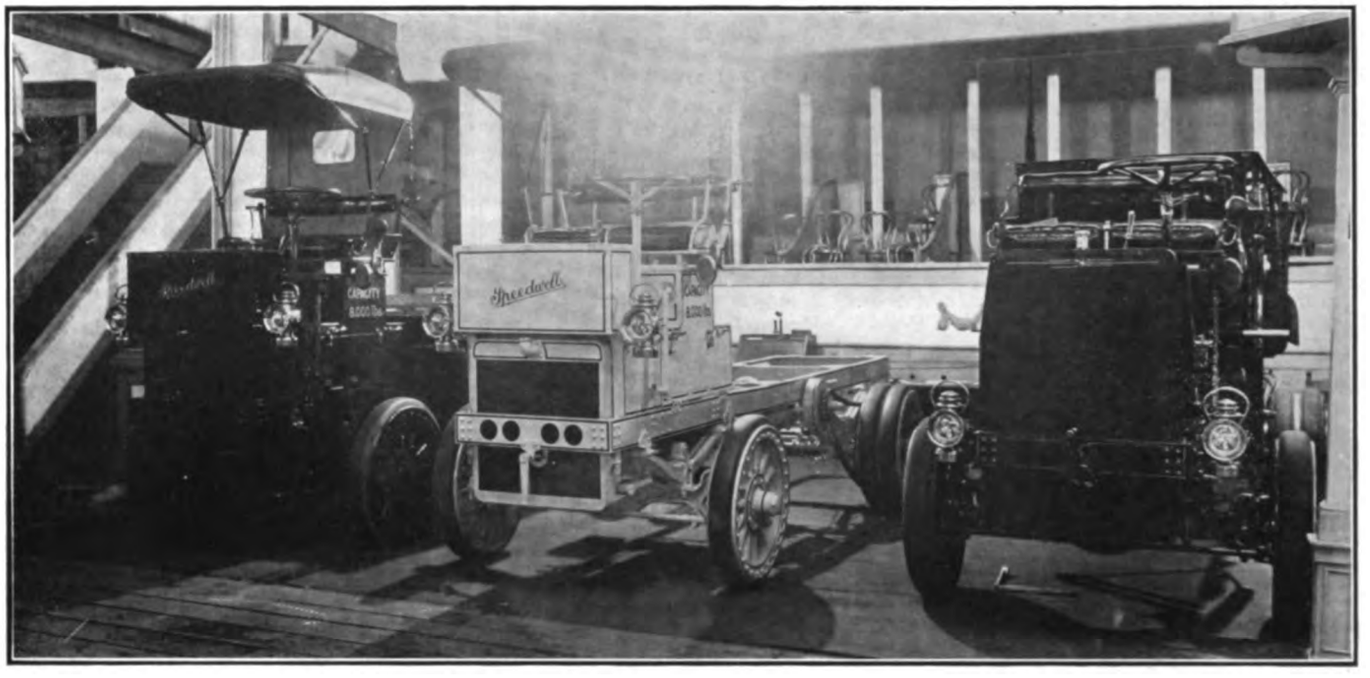
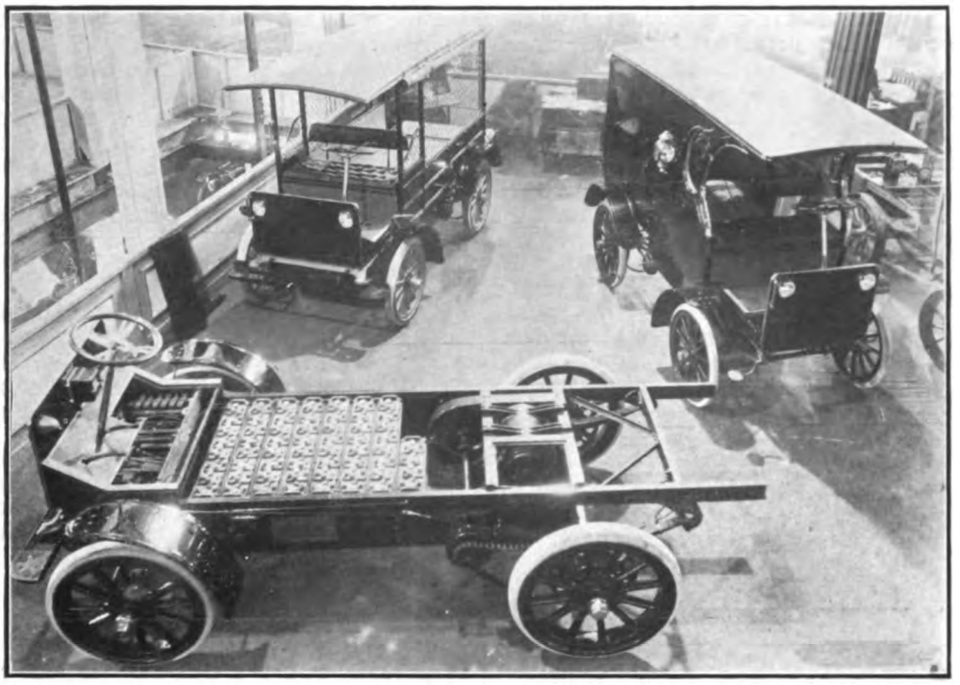


Exhibit of Speedwell Trucks Occupied a Prominent Position Underneath the Elevated Platform on the Main Floor.

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Detroit Electric Line Was Shown on the Elevated Platform.

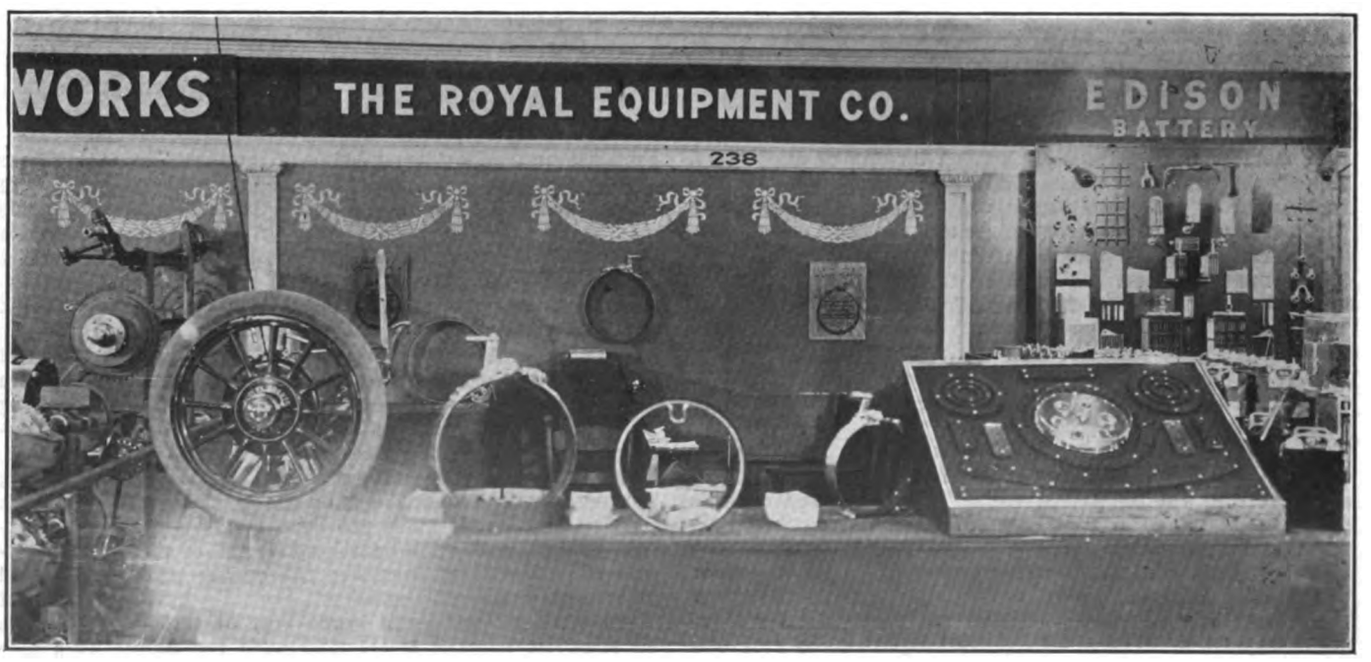
Springs are semi-elliptic in front and platform in rear. Wheels are of the artillery type, and are equipped with 36 by five-inch front and 40 by five-inch rear, standard S. A. E., demountable tires, dual behind.

Mack, International Motor Company, New York City. One-ton chassis, 1.5-ton army water filter wagon, three-ton telephone service wagon with winch, five-ton brewery wagon and seven-ton coal dumper. Motor is located in front, with driver and levers at the right. This portion of the International Motor Company's exhibit is made in the Mack works at Allentown, Penn. The chassis details offer very little change from the Mack trucks of previous years, the special features of the exhibit being the novel body designs.

The subject of dumping bodies appears to be receiving merited consideration by a number of makers, and the seven-ton coal dumper at this space was a centre of much interest throughout the week. The hoisting device is mounted on special braces fitted to the back of the cab, and the mechanism is operated by means of a transverse shaft directly beneath and in the same plane as the upper cross shaft. This is driven from a small countershaft, situated in the transmission, by means of a worm and worm wheel, and this small shaft is in turn operated by a sliding spur gear, which meshes with the second speed gear on the main transmission countershaft, when the hoist is to be used. When the sliding spur gear is thrown into mesh, the driving dog for the main countershaft gear is thrown out, which makes it impossible to move the vehicle while the body is being raised. The latter, however, can be stopped in any position, and the truck driven over the road without the body being drawn back to its original position.

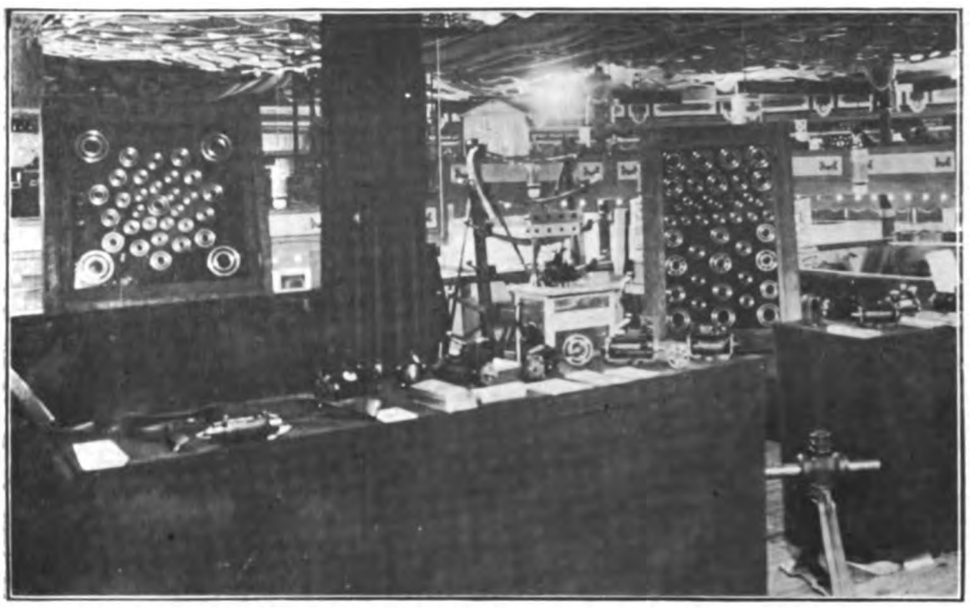
Driving into position for dumping, the operator moves the small hand lever at the right of the seat forward and downward, bringing a sliding gear into mesh with the second speed gear and at the same time disengaging the intermediate gear clutch. The gear shifting hand lever will be moved into the second speed, and the clutch let in, when the body immediately will begin to ascend. When in its extreme upward position, the clutch automatically is thrown out by means of a stop on the hoisting chain, which prevents the lifting arm being drawn over centre.

To lower: The reverse is engaged, and the clutch let in, when the body begins its descent. As before, the clutch automatically is thrown out, just before the body reaches the frame, which prevents the former coming down hard upon the latter. The small hand lever is pulled back into position and the driver is free to resume his journey for another load. The whole operation takes about 20 seconds. In the device shown the tail gate was operated automatically, although it is possible to obtain this for hand operation if desired. With the equipment as displayed, it is possible to unload the entire contents of the vehicle without leaving the seat, simply by moving the hand levers and depressing the clutch pedal.



Important Display of Duplex Brakes and Other Equipment, Made by Royal Equipment Company, Beside Edison Storage Battery Exhibit.

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Marburg Bros., Inc., Displayed Mea Magnetos and Other Products.

The water filter is a device patented by Osborn Congleton, for which the International Motor Company has secured the rights of manufacture. It is claimed that by its use, 500 to 1500 gallons of pure water an hour can be supplied, five minutes after the camp is pitched beside any stream. The master faucet controls the pump, which is operated by the motor. The water is drawn up through a series of filters, in which a variety of filtering materials is employed for the removal of bacteria and other impurities.

Martin Tractor, Knox Automobile Company, Springfield, Mass. One complete tractor mounted on a new Knox six-ton truck. Although originally designed to be supplied with three wheels and still marketed as such, the present arrangement is with one wheel in front and suitable mechanism in the rear for attaching to the king bolt of any horse drawn vehicle. The motor is a regulation Knox unit. A more complete description with suggestions for its use will be found elsewhere in this issue.

McIntyre, W. H. McIntyre Company, Auburn, Ind. One-ton delivery, 1.5-ton chassis and 1.5-ton mattress car with extra high top. Motor is located in front, under a hood, with driver and levers at the right. A notable change is is in the substitution of a four-cylinder vertical engine for the old two-cylinder opposed unit. The enclosed planetary transmission is another feature, and the service brake has been taken from the rear wheels and placed on the jackshaft. In other respects, the line has not been changed materially, and the governor is retained on all models.

Morgan, Morgan Motor Truck Company, Worcester, Mass. Two-ton express, three-ton chassis and five-ton coal dumper. Motor is placed in the cab beside the seat, with right hand levers and driver's position. Few changes in mechanical construction are noted, the same steel wheels, rubber cushioned jackshaft, etc., being retained. The addition of brake equalizers, auxiliary rear springs and a slightly heavier radius rod practically complete the list. The two-ton chassis is a new model, with the same essential Morgan characteristics.

The coal dumper proved of decided interest. Strictly speaking, it is not a dumper in the usually accepted use of the term. The body and load remain stationary, the coal being discharged through a metal chute by means of an Archimedian screw. Power to operate this is conveyed from the motor through a change gear mechanism, in which an extra gear and a shaft lead to a chain wheel mounted on the side of the chassis. A much larger wheel is mounted on the end of the conveyer shaft opposite to that on which the chute is attached to which it is fastened by a key. The withdrawal of this key permits the chain and wheels to rotate idly while the truck is being driven. When the load is drawn into position, the operator slips the key into place, when the motor turns the screw and the coal is forced out through the chute.

Packard, Packard Motor Car Company, Detroit, Mich. Two-ton stake body, and transcontinental prairie schooner, dairy wagon, cased beer wagon, van, gas crane, and slatted and gate sided body, all on three-ton chassis. Motor is in front under a hood, and driver is at the right with right hand levers. The two-ton model is new, being identical with the larger chassis, except for its lighter construction and its Packard 18 horsepower motor. The addition of an automatic spark retarding lever, for use in connection with starting, appears to be the only change of note.

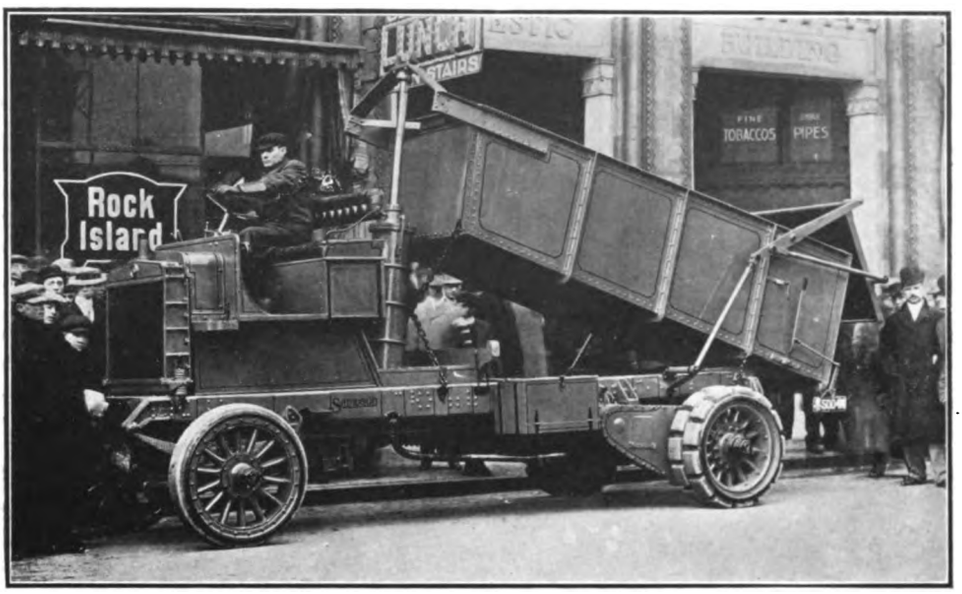
Peerless, Peerless Motor Car Company, Cleveland, O. One five-ton chassis. Motor is located in front under a hood, with driver and levers at the right. The design has proven so satisfactory under every kind of service during the past year that only such changes as make for refinement of detail are noted. Maximum speed of the motor is limited by the action of a centrifugal governor on butterfly valve, located in the intake manifold between the throttle and cylinders. Governor adjustments are enclosed in a housing, which is sealed. A shutter interposed between the jaws of the starting crank and crankshaft prevents cranking the motor until the spark has been retarded.

Pierce-Arrow, Pierce-Arrow Motor Car Company, Buffalo, N. Y. Five-ton chassis, coal dumper and brewery service wagon. Motor is in front under a hood, with driver and levers at the right. The principal feature of the Pierce-Arrow truck is the worm and worm wheel drive, which was



Splendid Exhibit of Ball Bearings Made by New Departure Company.

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Pneumatic Dumping Device Displayed at the Sampson Exhibit.

brought out last year. One of these assemblies, with the housing partially cut away, was presented for inspection and the attendants were extremely busy explaining its method of operation. As positive proof that the arrangement is completely reversible, opportunity was afforded for those who wished to make the worm drive the wheel, or the wheel the worm, with equal ease and smoothness of action. In all respects, it was announced that the 1912 model is exactly the same as the 1911. The dumping body is operated by hand winch.

Pope-Hartford, Pope Manufacturing Company, Hartford, Conn. Two three-ton service wagons, and combination chemical and hose wagon. Motor is located under the floor, with driver at the left and levers in the centre. Accessibility is afforded by tipping the seat backward, or the seat and floor boards together. This is the first time this well known pleasure car maker has exhibited a truck, although the first vehicles of this type were produced in the early summer.

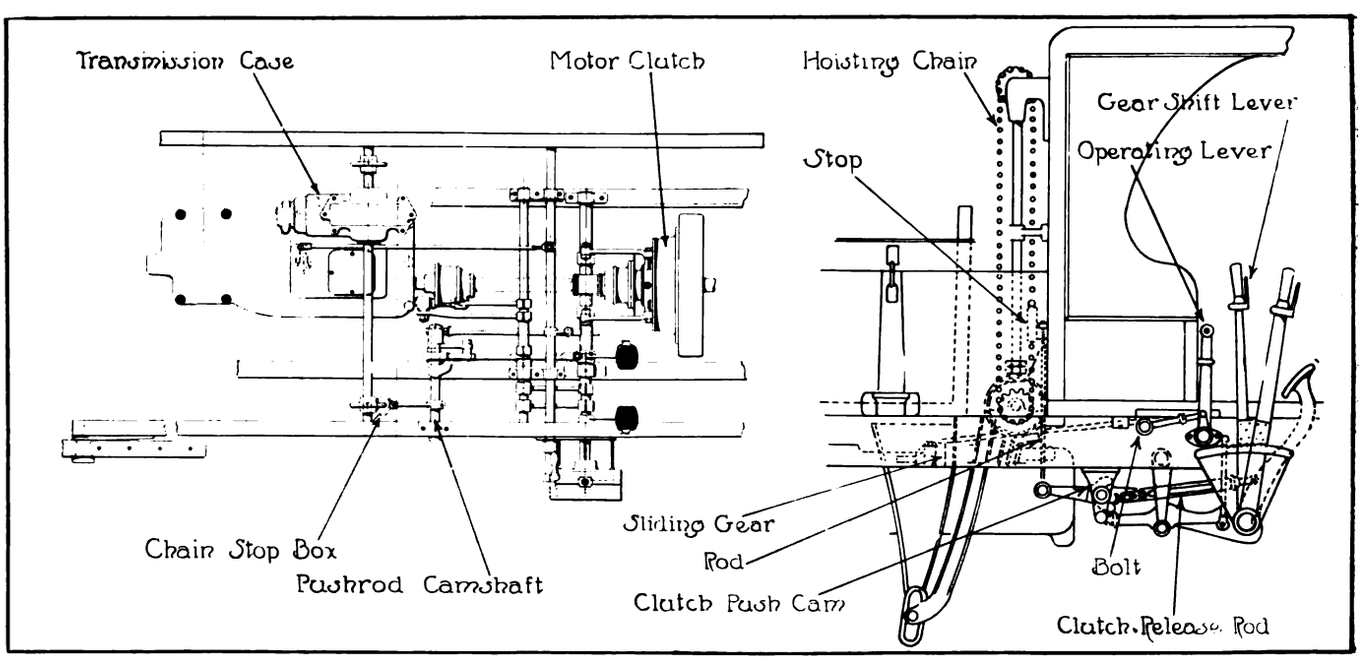
The motor is a four-cylinder, water-cooled unit, rated at 40 horsepower, the maximum speed being regulated by a governor operating entirely independent of either hand or foot throttle. Ignition is by Bosch high-tension magneto, dual system. Lubrication of the motor is by a mechanical oiler on the crankcase with a large suction pump and standpipe, which is used as an overflow, permitting oil when it reaches the level of the standpipe to run back through it into the crankcase. The crankcase proper is provided with standpipes, fitted with gauze strainers, serving to maintain at all times a predetermined level in the case. Oil is pumped from the oiler to the cylinders. The main bearings are lubricated by splash from the crankcase. The transmission and differential also are lubricated by splash. All other parts are provided with oil or grease cups wherever necessary.

The cone clutch is leather faced with cork inserts. The transmission is of the selective sliding type with three speeds forward and reverse. Drive is by double side chain. Springs are semi-elliptic, 44 inches in front and 50 in the rear. An auxiliary cross spring over the rear axle provides for overload. Wheelbase is 126 inches. Wheels are 36 inches, demountable, fitted with Timken roller bearings. The front axle is a solid I beam section, the rear member a solid forging.

Three sets of brakes are fitted; contracting bands on each end of the jackshaft, 12.4375 inches in diameter and 2.25-inch face; contracting band on transmission shaft, the same size, and emergency, internal expanding band on rear wheels, 18 inches in diameter with three-inch face. Tires are 36 by five inches, single front and 36 by four, dual in rear.

Very little change was noted in the fire apparatus, this concern having given its attention to the construction of these vehicles for some years.

Reo, Reo Motor Truck Company, Lansing, Mich. Three 1500-pound delivery wagons. Single-cylinder motor is located underneath the chassis. Driver is at the left with left hand levers. Practically the only change in design over that shown for the first time a year ago, is in the fitting of mudguards. The Reo has demonstrated its efficiency as a satisfactory solution of the light delivery problem under every condition to which it has been applied, and there appears to be little reason in the mind of the designer, R. E. Olds, for changing its mechanical construction.



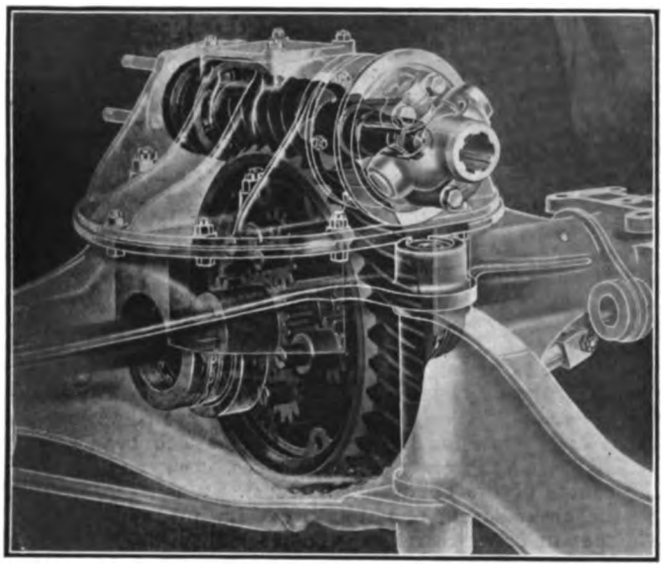
Sketch Outlining Features of the New Self-Dumping Body on the Mack Truck, Operated by the Motor Without Leaving Seat.

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Sampson, Alden Sampson Manufacturing Company, Detroit. One 1.5-ton chassis, 1.5-ton delivery, 1000-pound delivery, three-ton stake body and five-ton coal dumper. In the smaller vehicles the motor is in front under a hood, but with the larger it is under the floor boards. Driver is at either the right or left, with levers placed accordingly. Practically no change has been made in mechanical construction, except the coal dumper shown, on which the 42-inch rear wheels have been replaced with 36-inch members.

The dumping arrangement is decidedly new, a cylinder behind the driver's seat serving to raise and lower the carrying receptacle by means of compressed air. This air is stored under pressure of 100 pounds in a tank on the rear end of the chassis frame, a single-cylinder pump being operated from the change gear mechanism. This compressor may be connected directly to the pneumatic hoist, in case the storage tank should become punctured or the air line should develop a leak. A Westinghouse brake, operated from the seat, controls the admission of air to the cylinder. The end gate is so arranged as to open automatically, so that the entire operation of dumping the load may be performed without the driver leaving his seat.

Saurer, International Motor Company, New York City. One 6.5-ton chassis and imported pumping engine. The Saurer is manufactured at the plant in Plainfield, N. J.,



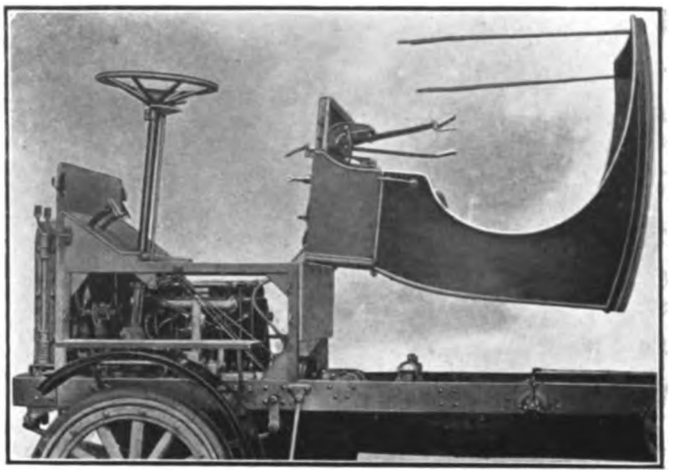
Skeleton View of Pierce-Arrow Worm and Worm Wheel.

and the new fire equipment also will be produced in America. The special features of the truck are retained, these being the novel type of carburetor with two nozzles, compressed air self-starter and so-called motor brake. As is more or less well known, this latter embraces a hand throttle lever on the steering wheel interconnected with the camshaft, which is so arranged that the timing of the valves can be changed to permit the motor to exert its maximum retarding effort.

The pumping engine is equipped with a 60 horsepower four-cylinder, four-cycle, water-cooled motor, which may be coupled to a centrifugal pump, capable of delivering 500 gallons of water a minute at 100 pounds pressure. The latter utilizes the Sulzer patented self-priming feature, which has given excellent satisfaction in service abroad.

Speedwell, Speedwell Motor Car Company, Dayton, O. Four-ton chassis, four-ton stake body and six-ton coal dumper. Motor is located under the seat, with driver and levers at the right. Accessibility is afforded by tilting the seat to the side, an exceedingly novel arrangement, which is expected to meet with decided favor. Mechanical changes are not numerous, the most important being the addition of a differential lock and an automatic advance magneto.

In the coal wagon, the dumping is effected by means of a motor operated rack and pinion mechanism, which takes its motion through double reduction gearing from the propeller shaft. Provision is made for depositing the



Tilting Seat Exposing Power Plant on New Pope-Hartford.

load at either side or the rear, so as to make the use of the truck equally valuable, whether or not it is possible to back up to the dumping location.

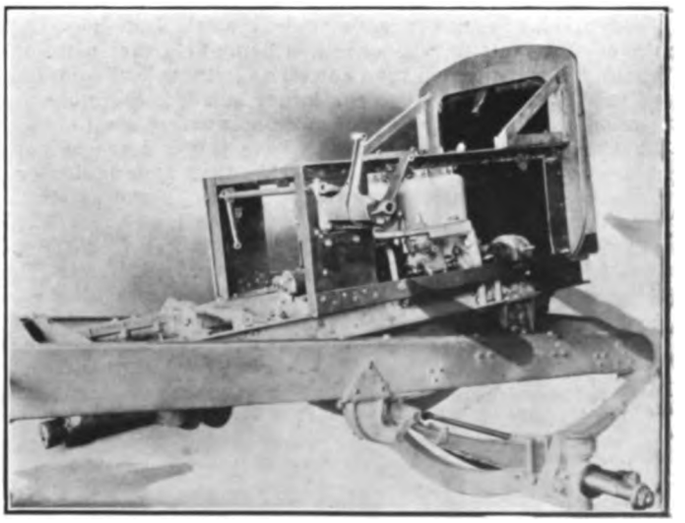
Stearns, F. B. Stearns, Cleveland, O. One five-ton chassis. Motor is in front under a hood, with driver and levers at the left. Engine and transmission are mounted on a subframe, which is carried by semi-elliptic springs on the main chassis frame. Practically the only change is the adoption of the left hand control, although the addition of a differential lock operated by means of a lever on the gear shift quadrant may be mentioned as well.

White, White Company, Cleveland, O. Fifteen hundred-pound delivery wagon, 1.5-ton 'bus, three-ton moving van, five-ton Standard Oil tank wagon and five-ton lumber body with trailer. Motor is in front under a hood, with driver either at the right or left with levers accordingly. The five-ton vehicle is an entirely new model, although its mechanical features do not differ materially from the three-ton machine, which has been the largest size manufactured by this concern heretofore.

Considerable interest attached to the lumber equipment with its trailer. These were loaded with heavy timbers, such as are used in subway construction in New York City. The trailer is a high two-wheeled device, shod with steel tires and equipped with brakes operated by lever from the driver's seat. It is attached to the main truck by means of chains. The forward portion of the outfit is designed for lumber work, independently of the trailer, and is fitted with rollers which assist in loading and unloading.

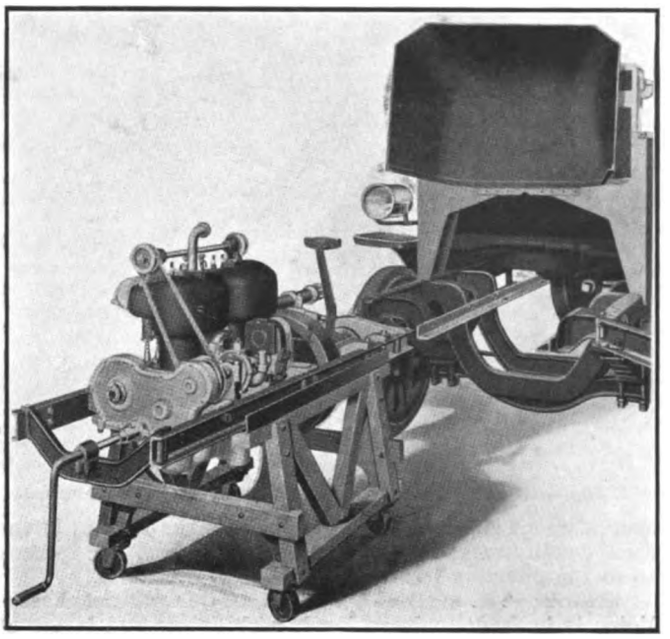
ELECTRIC COMMERCIAL VEHICLES.

Baker, Baker Motor Vehicle Company, Cleveland, O. Half-ton delivery, two-ton chassis and two-ton express body



Method of Mounting Motor in the New Losier Truck.

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Illustrating Accessibility of Grabowsky Power Plant.

with screen sides. Minor changes have been made in all models, and the larger chassis has been redesigned to conform with the smaller. Emergency brakes, mounted on the countershaft, have been added, and all bearings are now bronze bushed. Sprockets are reversible, so that when the teeth are worn on on side they may be turned. Controllers are enclosed this year.

Bronx, Bronx Electric Vehicle Company, New York City. Half-ton chassis, half-ton delivery wagon and four-ton chassis. This is an entirely new line, and includes machines in varying capacities from 800 pounds to five tons.

Motors are of the General Electric make, nothing less than 80-volt with 60-cell Edison battery or 32-cell lead battery on smaller models, and 85-volt with 44-cell lead battery, except when Edison is preferred, on the larger. All motor armatures run on ball bearings, in fact these are fitted wherever possible, the maker calling the product the ball bearing Bronx.

The first reduction is by quiet chain drive to the countershaft, housed in an aluminum casing, the chain running in oil. The second is by roller chain from the countershaft to rear wheels. All sprockets are of ample size, accurately cut from high grade steel. The steering gear is of the irreversible type with ball thrust bearings, rigidly mounted on chassis. Two sets of brakes are operated independently. All hubs are fitted with ball bearings, non-adjustable, it being claimed that these reduce friction to the greatest possible degree.

A special feature is made of the straight line drive from the countershaft to rear wheels, it being held that noise and chain "slapping" have been entirely eliminated. Frames are of pressed steel, except in the larger models, where channel section is used. Springs are of silico-manganese steel bushed. Shackle bolts are hardened and have integral grease cups. Axles are of nickel-vanadium steel, either rectangular or I beam section. The tire equipment is said to be well within the tire manufacturer's requirements for the load the vehicles are designed to carry.

Detroit, Anderson Electric Car Company, Detroit. One 1.5-ton chassis, half-ton panel body, one-ton screen side delivery. As is well known, the maker claims this machine has been built around the Edison battery. Few changes in chassis design have been found necessary, although the 1.5-ton model is new, with the same general characteristics which have distinguished the older members of the line. It is understood that two other sizes, a two and a three-ton, will be placed in the market in the near future.

G. M. C., General Motors Truck Company, Detroit. Three ton chassis, 1.5-ton delivery, six-ton express and English coach. This is a new line, although the design is by John M. Lansden, who has been engaged in the design and manufacture of electric commercial vehicles for the past eight years. It follows that he has incorporated a number of features which have been successful in service, and as a whole the line is in no way experimental, although offered to the public for the first time.

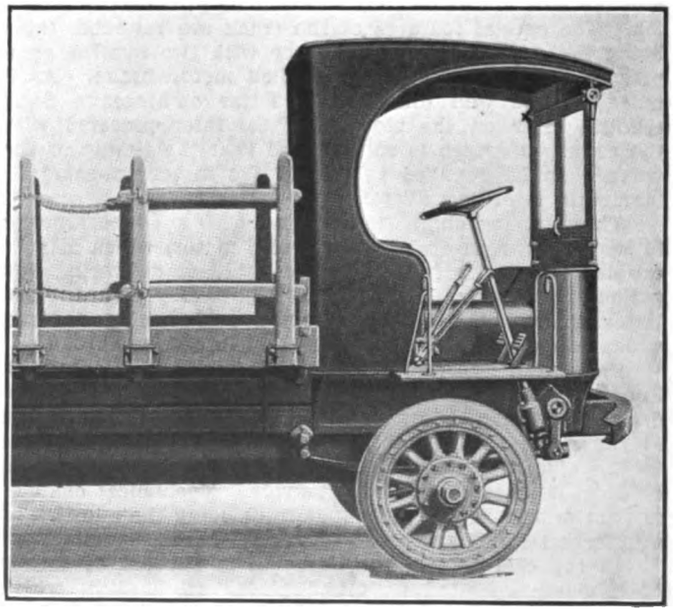
Complete accessibility is one of the distinguishing features claimed. The motor is of the single enclosed type, specially wound for maximum efficiency with the control and battery characteristics. The battery, either lead or Edison as specified, is located above the frame, and the controller is under a small hood in front of the dash. Five speeds forward and two reverse are obtained by a handle above and eccentric with the steering wheel.

The frame is of steel, channel section, with iron faced wood bumper in front. The drive shaft is of the Lansden type, a flat spring tempered steel blade, flexible and self-aligning. Countershaft is of the floating type, with non-adjustable ball bearings. Springs are semi-elliptic, both front and rear, with auxiliary helical members on the rear axle to take care of abnormal loads and road shock. Axles are solid forgings, front and rear, the steering knuckles being with electrically welded steering arms. Wheels are of wood of standard S. A. E. dimensions, Lansden dual members being employed for dual tires in the rear.

The six-ton chassis was the largest electric vehicle in the show, but chief interest in the exhibit centred around the English coach, which is built to accommodate 12 on the inside, one beside the driver and four on top. Entrance to the interior is by side doors.

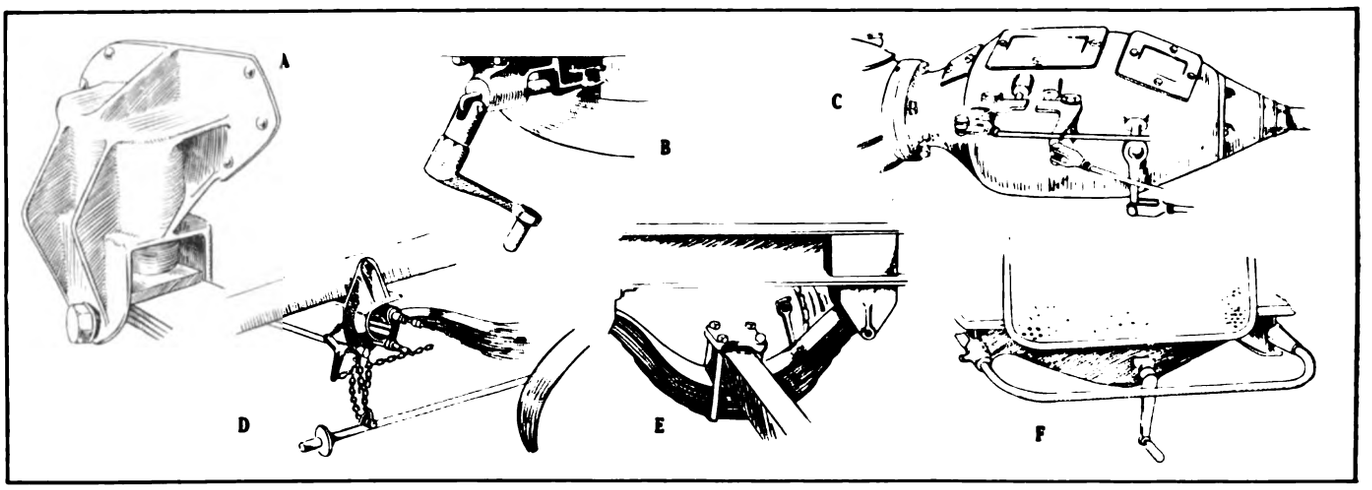
General Vehicle, General Vehicle Company, Long Island City, N. Y. One 750-pound delivery, 1000-pound delivery, two-ton American express wagon, 3.5-ton brewery bottling wagon, five-ton chassis, two five-ton keg trucks, five-ton bottling wagon, and one-ton industrial pier truck. The last named is a new model, and of especial interest. The remainder of the line is offered with practically no change, the remarkable success of General Vehicle wagons under all conditions of service having demonstrated that the detail construction is correct.

The pier truck is a low wheeled vehicle with platform in front for the driver to stand upon. Steering is accomplished with the rear wheels while the drive is through the front members. The controlling devices are somewhat unusual and correspondingly interesting. The brake pedal, which has a long crosswise foot piece, occupies a place in the centre of the operating platform. When this pedal is up the brake is on, and it is necessary to depress it with the foot in order to release the mechanism. The steering control is by means of a lever at the left hand side, having vertical motion only, and a corresponding lever on the oppo-



Location of Motor in the Cab on Five-Ton Garford.

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Some Mechanical Features Seen at the Garden: A, Sampson Supplementary Spring; B, Peerless Starting Crank Support; C, McIntyre Enclosed Planetary Gearset; D, Sprag on Locomobile; E, Hewitt Rear Spring; F, White Tubular Bumper.

site side operates the controller. The battery is sufficient to run vehicle 20 miles on a single charge, and is suspended in a cradle at the front.

Lansden, Lansden Company, Newark, N. J. Chassis, panel delivery and provision wagon, all of one-ton capacity. This practically is a new line, having been redesigned throughout. Comparatively shorter chains are used for final drive, and silent chains have replaced the roller members between motor and jackshaft. Frames are of steel instead of wood. A new suspension carries the motor from a single cross member instead of from two. Sprockets are keyed and tapered on instead of pinned. Timken roller bearings take the place of bronze, and the controller is of the open type instead of closed. A new method of attachment makes it possible to remove and replace the wheels readily.

Studebaker, Studebaker Corporation, South Bend, Ind. One 1000-pound panel delivery wagon. The line practically is unchanged, standard features having been demonstrated as satisfactory under severe usage in various classes of service. The vehicle shown has been made a trifle lighter in some respects and now uses Timken roller bearings. New battery equipment is said to give 15 per cent. greater mileage than was possible under old conditions.

Ward, Ward Motor Vehicle Company, New York City. Three delivery wagons of 700, 1000 and 1500 pounds, respectively. No new models have been added, and only slight changes mark the line. The old style plain bearings have been replaced by Timken roller members, and iron clad batteries are used instead of the grid plate style formerly employed.

Waverley, Waverley Company, Indianapolis, Ind. Half-ton delivery, one-ton delivery, 2500-pound chassis, three-ton chassis, and central station trouble wagon. The half-ton model is new, and employs a shaft drive instead of the usual Waverley chain. The battery is an Edison. In all other respects, it follows the essential Waverley characteristics. The trouble wagon practically is a remodelled pleasure vehicle, providing space for such tools and materials as would be needed in this work.

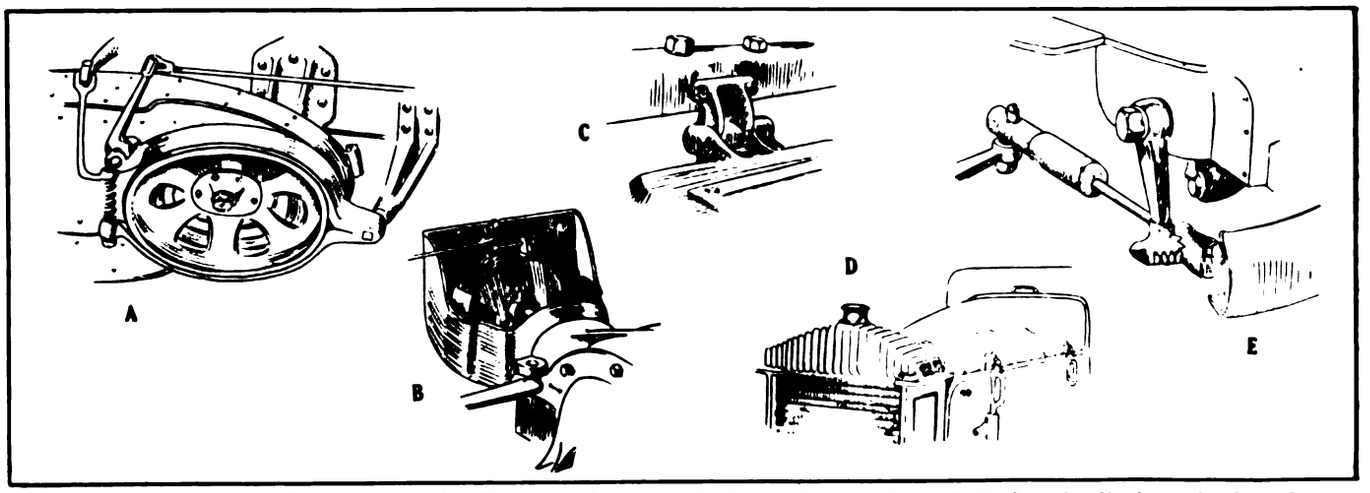
LANGE COMPANY TO MAKE TRUCKS.

The H. Lange Wagon Works, Pittsburg, Penn., maker of wagons for over 40 years, announces the organization of a subsidiary company to be known as the Lange Motor Truck Company which concern will erect a new and modern concrete factory with floor space of 40,000 square feet. When equipped the plant will begin the manufacture of 100 commercial vehicles as the first season's output.

The new industry is not altogether unfamiliar to the Lange concern as during the past five years it has represented the Gramm, Dayton and Chase lines, building bodies to suit the requirements of the purchaser. A feature of the Lange product will be that everything but the motor and wheels will be Pittsburg products. The engine will be a Continental. The best of material and workmanship will be employed and it is the plan of the company to manufacture a high grade machine.

KISSELKAR BRANCH NOT AFFECTED.

The KisselKar New England branch, Boston, is in no way connected with the Kissel Kar Kompany, a company in the hands of a receiver. H. B. Pruden, president of the former concern, states that none of the officials of the Kissel Kar Kompany are connected in any way whatsoever with his company.



Additional Constructional Details at Garden Display: A, Lozier Brakes and Chain Case; B, Grabowsky Enclosed Brakes; C, Locomobile Gearbox Support; D, Pierce-Arrow Radiator; E, Garford Steering Gear.

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TRUCK DISPLAY AT GRAND CENTRAL PALACE.

SHARING interest with pleasure cars and accessories, motor trucks were displayed in the new Grand Central Palace, New York City, Jan. 10-17. So well pleased with the success of the venture were the exhibitors of this type of vehicle that a determined effort was made to secure the support of the management in a plan to continue the show until Saturday evening, Jan. 20, at which time the Madison Square Garden truck display was brought to an end.

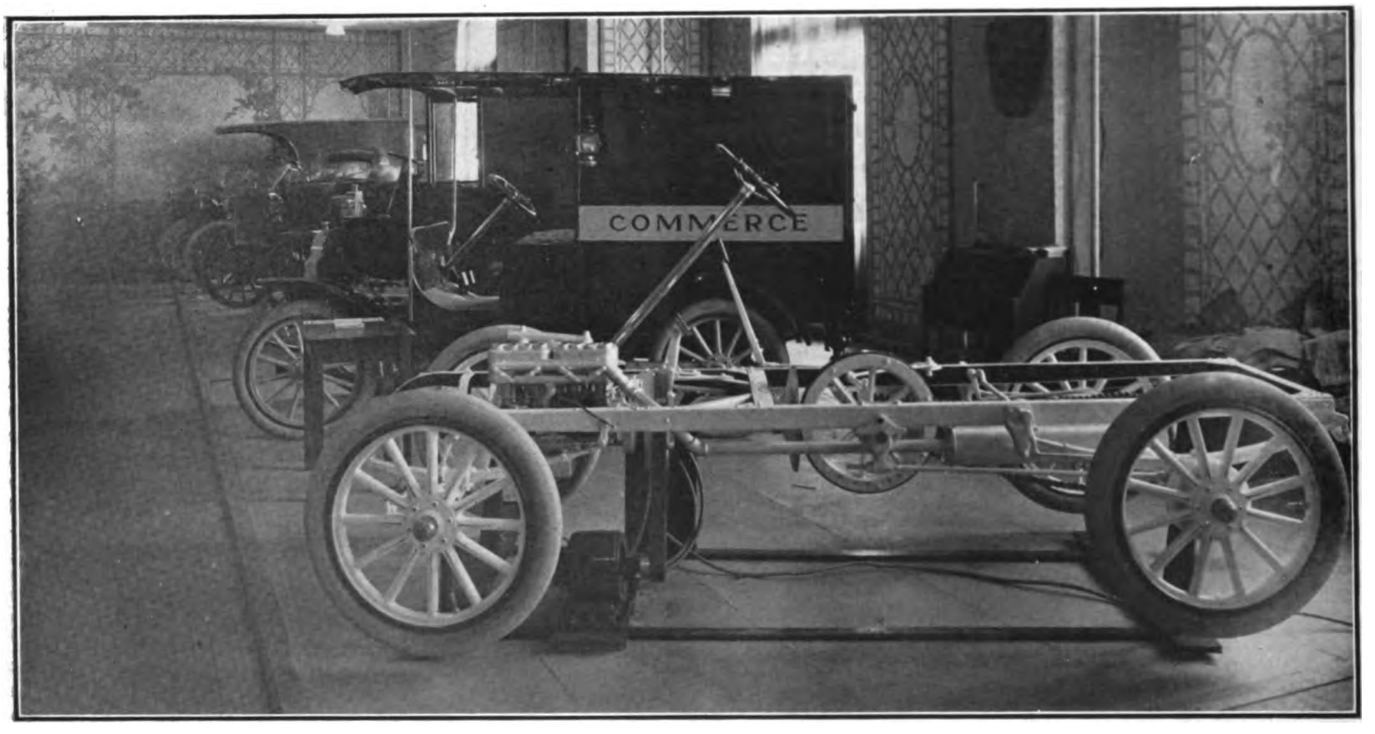
The exhibit was under the auspices of the National Association of Automobile Manufacturers, and the direction of S. A. Miles, general manager of that organization. The splendid appearance of the interior of the building was such that practically no decorations were needed. The following review of the exhibits presents first the make of machine, in alphabetical order, with name and address of the manufacturer, and the vehicles and chassis displayed by each.

Aries, J. Jaccard & Co., New York City. Seven-ton chassis and seven-ton brewery wagon. This is a French product and is more or less well known in America, although never exhibited at a New York show previously. Perhaps its chief distinguishing feature was the use of steel tires, although it is understood that rubber will be furnished upon order. A decompressor is fitted as an aid in starting, and a spring in the steering rod is designed to take shock off the driver's hands. The motor is very accessible, and is equipped with a governor. The general impression of the machine is one of great strength, and this is carried out even in minor details.

Atterbury, Atterbury Motor Car Company, Buffalo, N. Y. One-ton open delivery with standing top, two-ton stake body and three-ton brewery wagon with high panels. Motor is located in front under a hood, and driver and levers at the right. The line offers few changes from past design, although each model is now furnished with an automatic sealed governor, and fixed ignition by Bosch high-tension magneto.

Best, Durant-Dort Carriage Company, Flint, Mich. Eight hundred-pound chassis and panel delivery of same capacity. Driver is located above the motor with left hand control. This is an entirely new car, made in the factory of the Flint Motor Wagon Company in the same city. The motor is of the opposed cylinder type, rated at 12 horsepower, and is regulated by a centrifugal governor, which also automatically advances the spark when the speed of the engine requires it and insures a fully retarded spark for starting. A friction transmission is employed, comprising one driving and one driven disc, with final drive by side chain to rear axle. A particular feature is the yoke shaped steel frame which carries the discs and their shifting mechanism. This is secured under the main frame of the car with the yoke opening toward the rear. The countershaft, upon which the sliding disc is mounted runs in ball bearings carried at the ends of the yoke arms, and the driving disc is journaled in ball bearings at the apex of the yoke. The object of this construction is held to be that of imparting rigidity to this important part of the mechanism and preventing disalignment under heavy stresses.

Brooks, New York Auto Wagon Company, Brooklyn, N. Y. One buggy type delivery. Driver is placed in front with left hand seat location and right hand levers. This is also a new product in which several novel features are presented.



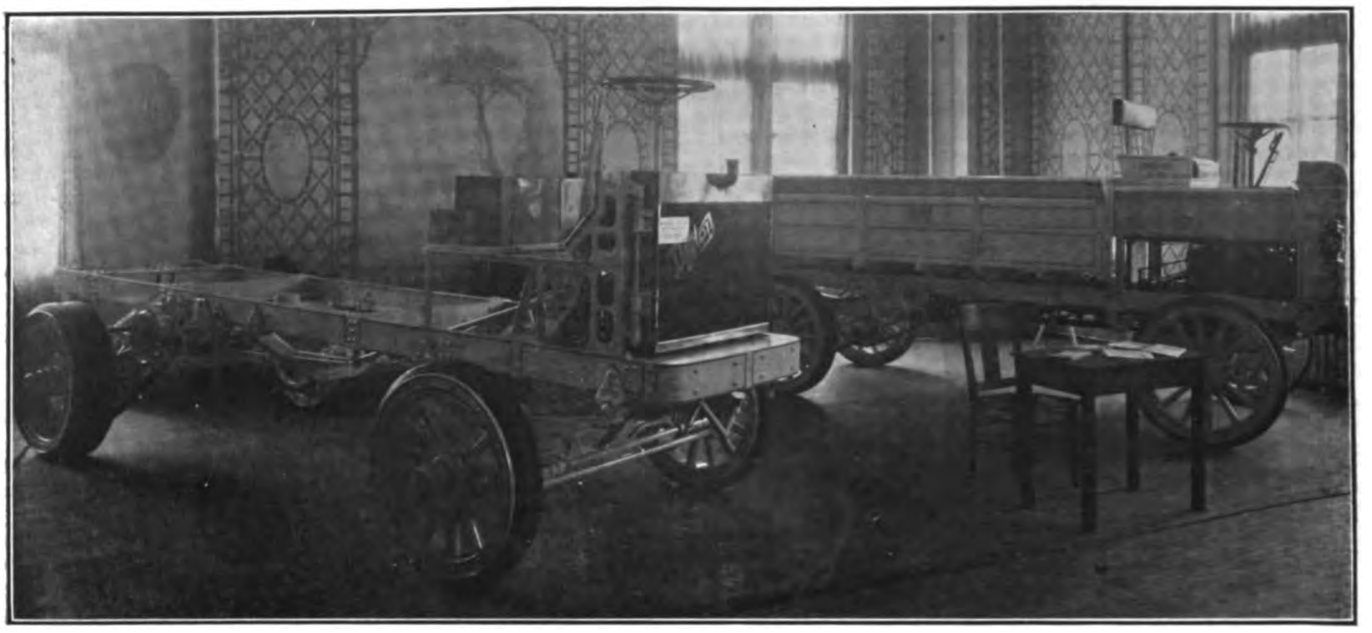
General View of One Corner of the Truck Display in Grand Central Palace, Friction Driven Commerce in the Foreground.

The motor is a two-cylinder, two-cycle, air-cooled horizontal unit, supported by means of shackles, transversely across the frame with crankshaft parallel with the rear axle, the distance between centres being varied by shifting the engine backward and forward to obtain the different speed ratios. The cooling flanges are built up of sheet copper vanes. Lubrication is accomplished by mixing the oil with the fuel as is usual with the two-cycle type. Ignition is by Bosch high-tension magneto.

The transmission is the roller device invented by Charles E. Duryea, in which the driving rollers are grooved and fit in correspondingly grooved rings bolted to the driving wheels and are attached to the crankshaft of the engine. There are two pairs of driving rollers, one for slow speed and reverse and a larger pair for high speed. Similarly there are two sets of rings, arranged concentrically with grooves facing.

Bringing the smaller rollers into contact with the outside rings, by shifting the engine with the speed control lever, obtains slow speed ahead. When these rollers are shifted so as to come in external contact with the inside

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Durable Dayton Occupied a Position of Vantage, in Which It Was Possible to Call Attention to Its Constructional Details.

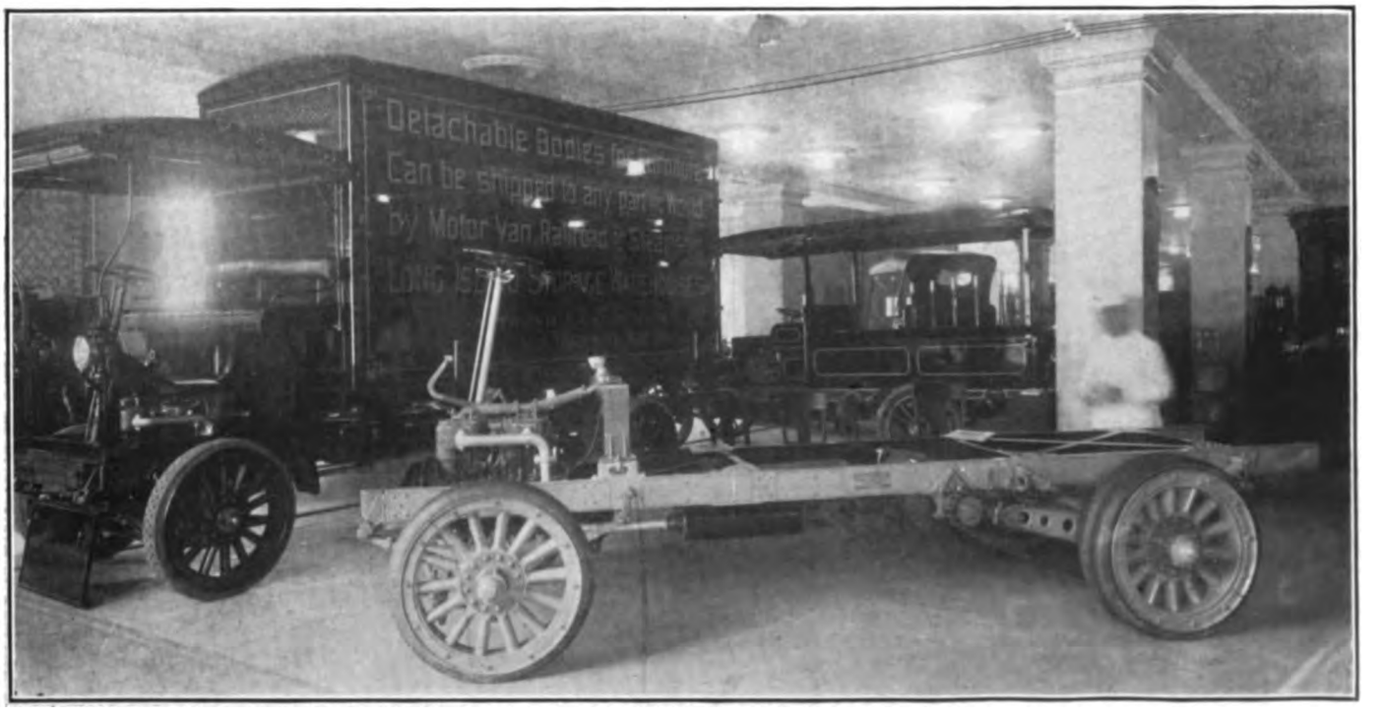
rings, reverse is secured. Shifting the rollers inward and forward brings the larger pair into internal contact with the outside rings and gives high speed ahead. The shifting devices are held to be simple and positive, being controlled by a single lever which is placed directly in front of the driver.

Cass, Cass Motor Car Company, Port Huron, Mich. Two-ton wide and low stake platform truck. Motor is in front under a hood, and is mounted on a sub-frame which rests on a three point suspension. The clutch is a patented combination of disc and cone. In all other respects there has been little change over previous construction. Special attention has been paid to springs, and the wheels are a trifle larger than is usual with vehicles of this capacity. A governor is fitted this year.

Chase, Chase Motor Truck Company, Syracuse, N. Y. One-ton chassis, one-ton panel delivery, 1500-pound panel delivery, one-ton screen body, 1.5-ton screen body and two-ton express flare board body. Motor is located in front under a hood, with driver and levers at the right. The 1.5 and two-ton vehicles are new, although they do not differ materially from the older and better known wagons of this make, with the single exception that they are of heavier construction. The motor is distinctive in that it is a three-cylinder, two-cycle, air-cooled unit, the system of air-cooling comprising a powerful suction fan, which is integral with the flywheel. An opening at the front and top of the motor, and another at the rear and bottom cause a strong current of air to be drawn in, circulated around the cylinders and passed out at the rear.

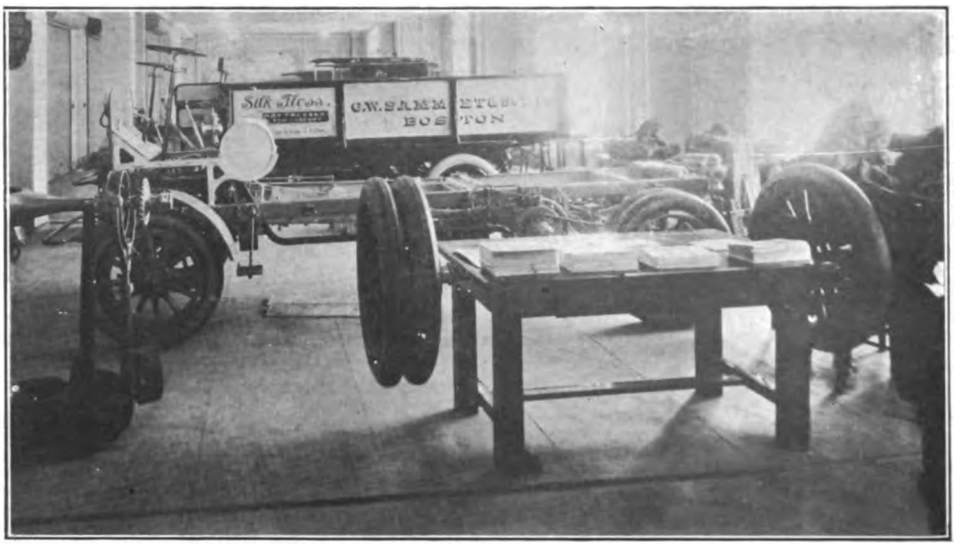
Commerce, Commerce Motor Car Company, Detroit. Half-ton chassis and panel delivery wagon of the same capacity. Motor is in front under a hood, with driver and levers at the right. The Commerce is another new design for New York shows.

The motor is a four-cylinder, four-cycle, water-cooled unit, with bore of 3.25 inches and stroke of 3.375 inches, rated at 20 horsepower. Cooling is by thermo-syphon, with flat tube vertical flow radiator and extra large reserve tank. Oiling is by the forced feed splash system, in which the lubri-



Comprehensive Showing of Universal Trucks, a Detroit Product Which Presents a Number of Distinctive Features.

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Decatur "Hoosier Limited" Was Shown for the First Time in New York.

cant is forced direct to both end bearings, and runs back into the crankcase through passages provided for this purpose. Ignition is by Bosch high-tension magneto with fixed spark.

The friction transmission is controlled by one lever, and final drive is by single chain to the rear axle. Brakes are internal expanding on rear axle, operated by pedal, and the friction reverse provides for emergency. Frame is of pressed steel, heavily braced and reinforced. Springs are semi-elliptic with swinging shackles, said to be very resilient and easy riding. Wheelbase is 96 inches. Front axle is a heavy tubular drop pattern with special reinforced steering knuckles and arms, and the rear member is of the centre chain type with live axle and large differential. Wheels are of the artillery type with large ball bearings in the front hubs. Tires are solid, 36 by two inches, front and rear, although pneumatics may be had upon special order.

Commer, Wyckoff, Church & Partridge, Inc., New York City. One 4.5-ton chassis, one 4.5-ton high stake body and one imported 6.5-ton brewery wagon. Motor is in front under a hood, with driver and levers at the right. There practically is no change offered in this well known line, a distinctive feature of which is the gearset. This is of the constant mesh type, in which dog clutches serve to connect the individual gears to their shafts, only when permitted to do so by a special governor, which prevents such movement except when the engine speed is at a proper point with relation to the speed of the car.

Dart, Dart Manufacturing Company, Waterloo, Ia. One 1500-pound panel delivery and one 1500-pound flare board wagon. Driver is located above the motor, which is underneath the chassis, and levers are at the right.

The motor is a two-cylinder, four-cycle, water-cooled, opposed unit, with bore of 4.25 inches and stroke of five, with valves interchangeable and mechanically operated, rated at 16-20 horsepower. Cooling is by thermo-syphon with extra large honeycomb radiator of the square tube type. Ignition is by Splitdorf magneto and dry cells. Lubrication is by a pump oiler on top of the crankcase for the engine, while all other parts are provided with grease cups.

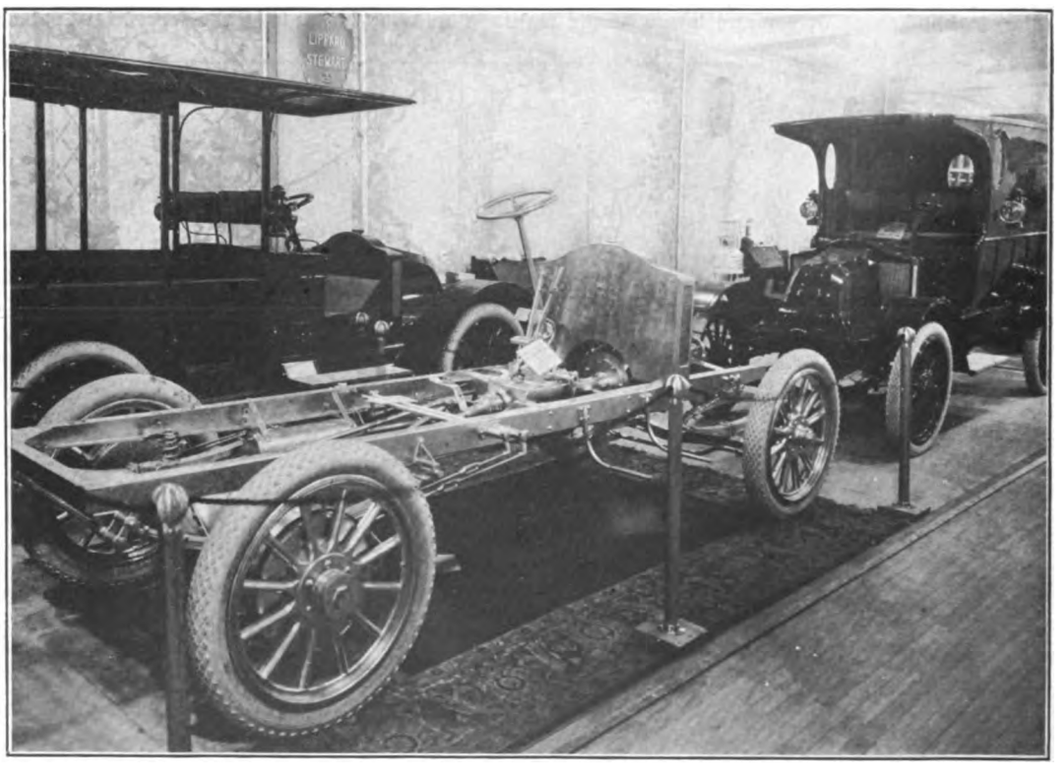
The transmission is an improved planetary, giving two speeds forward and reverse, low speed and reverse being secured by pedal and the high speed by hand lever. Clutch is a multiple disc member. Drive is by three roller chains. Brakes are internal expanding on rear wheels, operated by hand lever, with external contracting service brake on the jackshaft actuated by pedal.

Axles are square steel, 1.5 inches front and 1.75 rear, with ball bearing hubs. Frame is of pressed steel, securely braced with cross braces supporting the motor. Wheels are 34 inches, with 1.75-inch Firestone side wire tires. Springs are full elliptic front and rear. Wheelbase is 80 inches.

Decatur, Decatur Motor Car Company, Decatur, Ind. One 1.5-ton chassis, and low sided box body of the same capacity. Motor is under the floor with driver and levers at the right. Although this line was produced in a number of differing models last year, it is announced that the entire energy of the company will be devoted to the manufacture of but this one chassis in 1912.

The chief characteristic of the Decatur "Hoosier Limited," as it is called by the maker, is the accessibility of the power plant, a 30 horsepower Rutenber. The body is held in place by four bolts, and above this are located the dash and seat units, the former comprising the radiator, dash, floor boards, clutch and brake pedals, foot throttle, gasoline tank, side panel locks, change speed lever and emergency brake control. This also is held in place by four bolts, as are the seat and side panels.

The radiator is hinged at the side, so as to open like a



A "Golden Chassis" Occupied the Centre of the Lippard-Stewart Display.

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door. If it be desired to remove the entire power plant, the loosening of four bolts, makes it possible to lift off the seat unit, and loosening four more bolts permits the removal of the dash unit. This is claimed to be the work of but a few moments, and makes it possible to replace the motor without difficulty any time desired, whether the truck be loaded or not.

The rear spring system also is somewhat peculiar. In addition to the three-spring platform system, there is a cross spring extending from centre to centre of the main rear springs, its ends just above flat plates bolted to the tops of the main springs and clearing them by about .5 inch. The centre of this auxiliary member is clipped to a cross frame. Rollers at the ends prevent any undue friction and wear.

Durable Dayton, Dayton Auto Truck Company, Dayton, O. Three-ton chassis and 1.5-ton express wagon. Motor is under the floor. Driver is at the left with centre levers. The line comprises three models, the other being a five-ton machine, in which the same features are incorporated throughout, the only difference being in the size of the engine and the strength of construction. All motors are of the T head type with a tendency toward the long stroke. Lubrication is by forced feed through crankshaft to all bearings, no oil being carried in the crankcase.

The motor is located on a sub-frame and the transmission is carried on a three point suspension. Drive is through a Hele-Shaw multiple disc clutch to a selective sliding gearset, thence by propeller shaft, placed in a straight line with the engine and using two universal joints, one at either end, one of which is a sliding joint. Final drive is by side chains from the jackshaft to rear axle.

Eclipse, Eclipse Truck Company, Franklin, Penn. Two-ton chassis, one-ton flare board with top, three-ton screen side express and four-ton stake body with top and side gate. Motor is under the floor with driver and levers at the right. While it is announced that this line will carry a compressed air self-starter, it was not shown at the exhibit. A governor is fitted on all models.

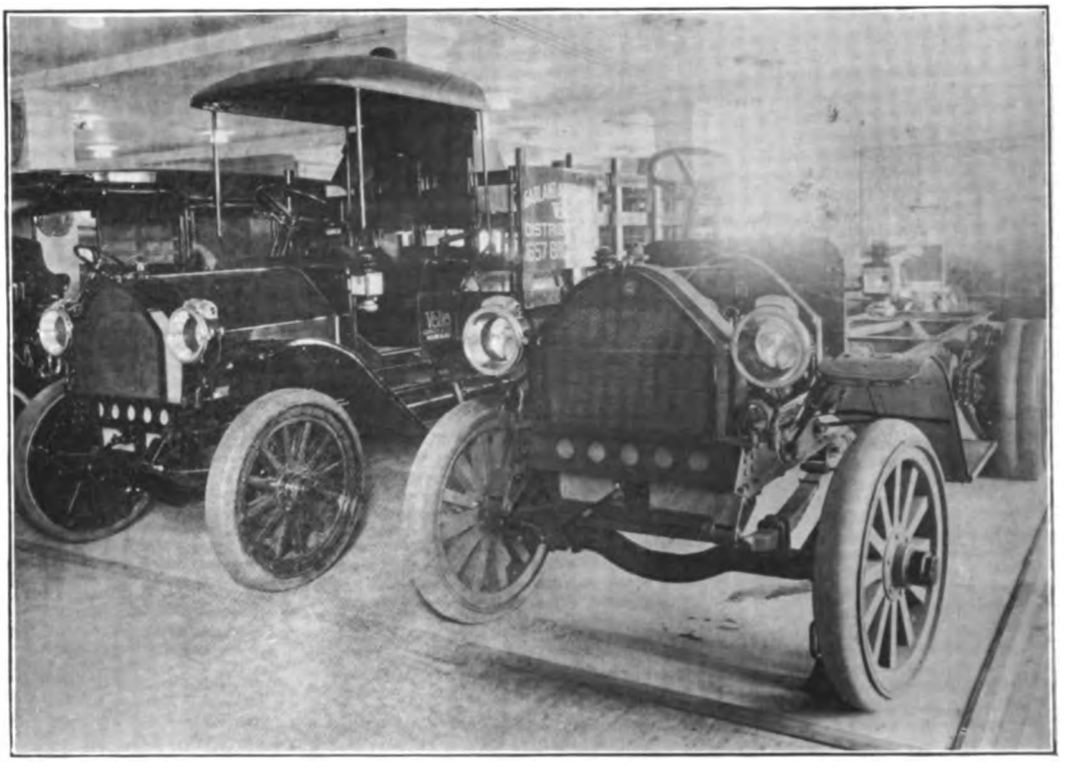
The motor is on a sub-frame, and complete accessibility for replacement is provided by the removal of the entire seat framing, the work of a few minutes only. A cone clutch, leather faced, is employed. The transmission is of the selective type, providing three speeds forward and reverse, with gears always in mesh, combined with differential and jackshaft. Final drive is by chains.

Frame is of steel, four-inch channel section. Wheelbase is 106 or 112 inches. Wheels are of the artillery type, fitted with solid tires, single front and dual rear. Axles are roller bearing. Springs are of silico manganese, semi-elliptic in front and platform rear. Two sets of brakes are fitted, the service members being double duplex in jackshaft and the emergency, double internal expanding on rear hubs.

Federal, Federal Motor Truck Company, Detroit. Chassis, screen side express and low stake platform body, all of one-ton capacity. Motor is in front under a hood, with driver and levers at the left. In order to attain the utmost accessibility of parts liable to need attention, this company has arranged the mechanism in three units, motor, clutch and transmission, each removable independently of the others. A governor of the centrifugal ball type is located in the throttle, permitting a maximum car speed of 15 miles an hour.

The four-cylinder, four-cycle, water-cooled motor is hung directly on the side rails of the frame, eliminating the necessity for the sub-frame. The selective sliding gear transmission, and the jackshaft to which it is bolted, are carried on a three point suspension, and the details of this mounting are somewhat noteworthy. Two horseshoe shaped brackets, with the openings hanging downward, carry the outer end of the jackshaft, being counterbored to receive the jackshaft tube brackets. Thus, by merely removing the retaining screws and sliding the tube brackets out a short distance from the frame, the rear end of the transmission-jackshaft unit drops down. It is then taken out of the chassis by moving the whole unit backward a short distance to disengage the universal mounting in front.

Drive is taken through a radius rod which consists of four parts; the hub brake centre which is mounted on the axle, the radius rod proper hinged to the hub brake centre, the radius rod connection which mounts on a spherical seat on the jackshaft tube bracket, and the radius rod adjuster which is threaded into the radius rod and the radius rod connection. It is claimed for this construction that it has several important points in its favor. Movement in any direction is taken care of without throwing any strain on the parts of the radius rod, as the front end is universally mounted, the hub brake centre is free to rotate around the axle, and the hinged joint at the rear allows sufficient movement to take care of any side sway that may occur.



Self-Starting Velie Line Was Well Represented by Three Vehicles of Varying Sizes.

Gramm, Gramm Motor Car Company, Lima, O. Two-ton express, three-ton chassis and six-ton dumper. Motor is in under the floor, with driver and levers at the right. Among the special features are the mounting of the engine on a sub-frame, permitting easy removal, and the fitting of a centrifugal ball governor on the throttle. All models are alike, with the exception of size and weight. Few changes are noted over previous construction.

The dumping body displayed is of special interest, the dumping feature being operated by the motor. A nickel steel pinion keyed into the rear end of the propeller shaft engages with either one of a pair of meshed gears of the same size hung in a pivoted cage. One of these communicates to a universal shaft extending forward to a point just behind the seat, driving the gears of the body actuating

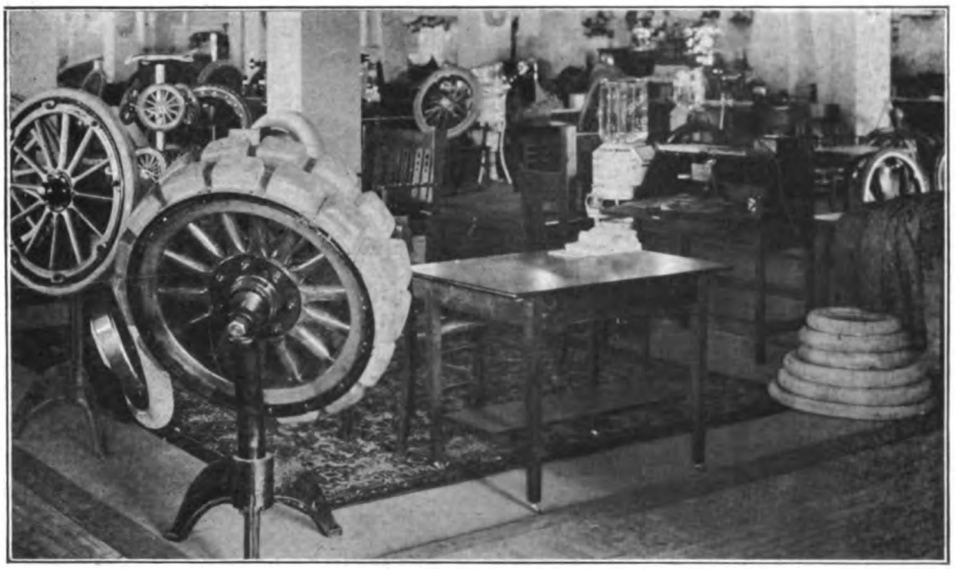
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mechanism. The cage is connected by a lever at the driver's seat mounted on a quadrant, the three positions of which give forward, reverse and neutral movements. Incorporated in the mechanism is an irreversible worm and wheel, which holds the body in any position when the control gears are shifted into neutral.

The winding drums for raising are located immediately back of the seat. Chains from these extend upward and over sheave wheels supported on a derrick, thence downward to the lower end of two upright legs on the front of the body, where they are secured by means of steel fastening brackets. The raising may be accomplished either with the truck at rest or while moving, so that it is possible to spread the load, the body being designed primarily for use in hauling road building materials.

Kelly, Kelly Motor Truck Company, Springfield, O. One-ton chassis, one-ton open express, three-ton express, and two-ton chassis fitted with 12-passenger hotel 'bus. In the smaller model, the motor is in front under a hood, while in the larger vehicles it is under the floor. Driver is at the left with central levers. All models are fitted with a governor. Practically no change has been made in the line, the distinctive feature being the air-cooled motor, which has been improved in a number of minor details.

Knickerbocker, Knickerbocker Motor Truck Manufacturing Company, New York City. Three-ton screen side brewery wagon and four-ton coal dumper. Motor is under the floor, with driver and levers at the left. This is a new product which has a number of distinctive features, chief among which is the method of mounting the motor and the provision made for its removal and replacement.



Impressive Showing Made by the Product of the Goodyear Tire & Rubber Company.

Beginning at the radiator, which is of the honeycomb type and suspended on springs or stanchions which are attached to or supported on the bumper, it will prove of interest to note the provision for accessibility. The bumper is hinged so as to swing open, carrying the radiator clear, so that the motor may be drawn out at will. The engine, a four-cylinder, four-cycle, water-cooled unit, is suspended on a hickory sub-frame, which may be drawn out as a drawer is withdrawn from a desk.

The clutch, a leather faced cone, also may be removed in 15 minutes, and the same holds true of the transmission, which is of the selective type, giving three speeds forward and reverse. This removability is still further extended to the jackshaft, of the full floating type, in a one-piece pressed steel housing. Still another feature is the placing of two coil springs directly under the frame on the rear axle, to provide an auxiliary member to take care of overloading.

Lubrication of the motor is by means of a positive gear driven pump located at the bottom of the commutator shaft and contained within the lower crankcase. The oil is filtered and forced through tubes to the main bearings and crankpits. A cup projection on the connecting rod caps picks up lubricant on every revolution and further assists in caring for the bearings. The oil level is shown by a ball in a gauge at the side of the crankcase. An overflow is provided which is held to eliminate flooding and smoking.

Koehler, L. E. Schlotterback Manufacturing Company, Newark, N. J. One 1600-pound panel delivery wagon and two panel bodies. Motor is under the chassis, with driver at the left and the levers at the right. This line is marketed by the H. J. Koehler Company of New York City, and is entirely new.

The motor is a two-cylinder, four-cycle, water-cooled, opposed unit, with bore of 5.25 inches and stroke of four. Lubrication is mechanical and integral. Cooling is by thermo-syphon, through large pipes and large radiator at the front. The carburetor is of the float feed type. Ignition is jump spark with true high-tension Splitdorf magneto, the instrument being located on top of the motor and driven direct by enclosed gears.

Drive is in a direct line from motor to jackshaft, immediately connected by universal joint. Final drive is through double side chains to rear wheels. Transmission is of the planetary type. Clutch is a cone. Service brake is on the jackshaft, metal to metal with 75 square inches of braking surface and at a three-to-one reduction from the rear wheels. Emergency brakes also are metal to metal, operated independently.

Frame is channel section steel, U shaped. Springs are semi-elliptic in front and full elliptic in rear. Front axle is a one-piece drop forging with knuckle yokes integral. Rear member is two inches square. Tires are two-inch solid, front and rear. Wheelbase is 76 inches. Wheels are of the buggy type.

Lauth-Juergens, Lauth-Juergens Motor Car Company, Fremont, O. One-ton flare board express, and three-ton high side brewery wagon with side gate at the forward end. Motor is under the floor, with driver and levers at the right. A particular feature of the exhibit was the driver's cab on the three-ton model, this being completely enclosed with glass windows on all sides, giving the occupants complete protection from the weather.

The motor is a Rutenber four-cylinder, four-cycle, water-cooled unit. Lubrication is by splash system. Ignition is by Bosch or Mea high-tension magneto and battery. The clutch is the firm's own patented, three-piece disc member, having only three parts, and consisting of two metal discs between which is a fibre disc with large friction surface. The clutch has a universal joint between the flywheel and transmission, making it flexible and eliminating all end strain between crankshaft and transmission.

The transmission is of the selective sliding gear type, giving four speeds forward and reverse. This also is the firm's own patented device, and is housed with the jackshaft as a unit. Four semi-elliptic springs front and rear are made of chrome-vanadium steel. Axles are heavy, solid steel forgings with heavy steering yokes and ball bearings throughout. Emergency brakes are contracting on drums on jackshaft, while service members are internal expanding, operating on drums on the rear wheels. Wheels are 38 inches in diameter, equipped with five-inch solid tires in front and four-inch dual members in rear.

Lippard-Stewart, Lippard-Stewart Motor Car Company, Buffalo, N. Y. Chassis, panel delivery and open delivery, all of 1500 pounds capacity. Motor is in front under a hood. Driver is at the left with centre levers. The startling feature of the display was the "golden chassis," on

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which the parts had been so skilfully gilded as to leave nothing in its original color except the tires.

Accessibility and the elimination of parts which might cause trouble in the hands of an inexperienced operator are among the chief claims for the Lippard-Stewart. Each unit is so arranged that it is possible to remove and replace it without disturbing any other unit. The small four-cylinder motor, and the low geared (five-to-one) shaft driven axle make a combination which is held to give a surplus of power for all occasions with a remarkably small consumption of gasoline and oil. Fixed ignition is another attempt to reduce complications.

The radiator mounting follows foreign practise, in that it is mounted behind the motor at the dash. Reduced vibration is provided by suspension on coiled springs. The water pump is eliminated, as well as the belt driven fan, suction blades on the flywheel taking the place of the latter.

The selective sliding transmission provides three speeds forward and reverse, and is located immediately under the floor boards, where it can be removed easily should occasion require. Instead of the chain drive construction a shaft drive and full floating rear axle are employed. Particular attention has been paid to the design of the frame. In front it is curved inward about three inches to give a short turning radius. Two sets of brakes are fitted, expanding and contracting on the rear axle.

Maxim Tricar, G. H. Bushnell Press Company, Thompsonville, Conn. One tricar, fitted with two-cylinder, air-cooled vertical motor, mounted over the front wheel. Although described as an air-cooled engine, a pair of hollow ribbed columns containing water is provided for cooling the exhaust valves.

The particular feature of the construction is the speed changing device, which is of the hydraulic type. A small cylinder-like compartment, somewhat smaller than the crankcase of the engine and carried on the extension of the crankshaft, is filled with oil. When no power is to be transmitted, the vanes on the shaft disc are folded, and if the motor be started then the disc and its vanes will churn idly in the oil. When the handle is turned upward so as to open the vanes, the oil starts circulating in the casing being thrown violently from the pockets formed by the movable vanes into those formed by the fixed members, and imparts to the latter, and of course to the casing, the sleeve and the attached sprocket, chain and the front wheel of the car, a rotary motion. When the movable vanes are raised still further, there is more violent movement of the oil, which is thrown with great force and in greater volume into the fixed vanes, and more power is transmitted, until on full opening, when there is just room for the vanes to clear each other, the shaft disc and the sprocket carrying casing rotate almost together, there being a very small amount of slip or lost motion.

Modern, Bowling Green Motor Car Company, Bowling Green, O. One 1500-pound chassis, one 1500-pound open body and one 1000-pound screen side body. Motor is in front under a hood, and driver either at the right or left, with right hand levers placed accordingly. This is another new product, so far as the New York shows are concerned, and is made only in the light delivery class.

For the smaller wagon the motor is rated at 25 horsepower, and for the larger 30. Both are of the block type with all valve mechanism enclosed, and water-cooled by forced circulation. The lubricating system includes a positively driven pump wth sight feed on the dash. Drive is through cone clutch, three-speed selective sliding gearset, jackshaft and side chains to rear wheels. Pneumatic tires are fitted as standard equipment, but solids may be had if preferred.

Motor Wagon, Motor Wagon Company of Detroit, Detroit. Three-seated 'bus, stake platform, panel delivery, open side flare board, open side with top, and chassis, all of 800 pounds capacity. Motor is in front under a hood, and driver at the left with centre levers. This vehicle also was shown for the first time.

The motor is a two-cylinder, two-cycle, water-cooled, horizontal opposed unit, with bore and stroke of four inches, rated at 16 horsepower. Cooling is by thermo-syphon. Lubrication is by positive mechanical sight feed oiler. Ignition is by Bosch high-tension magneto with fixed spark.

The transmission is of the planetary type, with self-contained multiple disc clutch, the entire assembly being mounted on ball and roller bearings and enclosed in an oil tight case. Three speeds forward and reverse are obtained. Drive is by double side chains from jackshaft to rear wheels. Frame is of steel, channel section. What is claimed to be a three point spring suspension is employed, this comprising one set of semi-elliptic members in front and two full elliptic in the rear. Wheels are of the artillery type, 32 inches in diameter, fitted with two-inch solid tires in front and 2.5-inch solids in the rear, although pneumatics may be had at an extra charge.

Newark, Newark Automobile Manufacturing Company, Newark, N. J. One 1000-pound chassis, one 1500-pound panel delivery wagon and one 1.5-ton chassis. Motor is in front under a hood, and driver at the left with centre levers. This new truck has a number of distinguishing features, chief among which may be mentioned the worm drive.



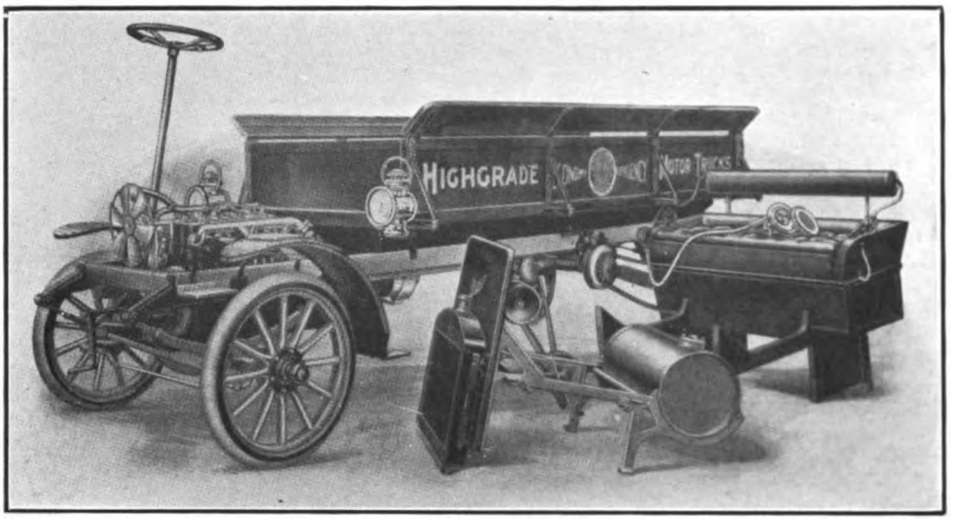
Where United States Tires Were Exhibited in the Accessory Division.

Everything about the car is enclosed. The motor is a four-cylinder unit, cast en bloc, with all working parts enclosed, the covering of the valve mechanism being the first step in what is claimed to be a special effort to reduce excessive noise. The leather faced cone clutch runs in oil. The three-speed selective gearset is carried in a casing which is secured to that of the clutch, which in turn is bolted to the motor crankcase, making a complete unit. The worm and gear are imported from abroad.

On the steering column is a little brass cylinder from the top of which rises a small rod with a ball shaped head. When the motor is running and the oil is circulating actively, the pressure of the lubricant, communicated to the little cylinder through connecting pipes, keeps the ball ended rod pressed up and the driver can determine at a glance that the oil is moving as it should. In the dark, he has but to press his finger on the ball, and if it be down, either the oil is exhausted or something else is wrong.

The enclosed feature is extended to the ends of the semi-elliptic springs and joints, which are protected by metal

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Decatur Seat and Dash Units Dismounted to Illustrate Accessibility of Power Plant.

hoods, which exclude all dust and retain lubricating grease. In fact, this attention to detail in this regard, throughout the entire mechanism, has been carried to an extreme.

Packers, Packers Motor Truck Company, Wheeling, W. Va. Two-ton chassis and two-ton panel butchers' wagon. Motor is in front under a hood, with driver and levers at the right. The line also includes a four-ton model, which was not shown. Standard design has been followed throughout.

The motor is a four-cylinder, four-cycle, vertical unit, water-cooled and with inlet and exhaust valves on opposite sides, mechanically operated. Lubrication is by force feed to all crankshaft and camshaft bearings and splash for connecting rod and cylinders. Ignition is by dual system, Splitdorf low-tension magneto and Splitdorf non-vibrating coil on the dash.

The clutch is a Hele-Shaw multiple disc. Transmission is selective with three speeds forward and reverse, and is mounted on the jackshaft, both being on a three point suspension. Final drive is by double side chains to rear wheels. Frame is of steel, channel section, heavy reinforced in the centre. Springs are long and wide, of silico-maganese steel. Front axle is an I beam section, with very large steering knuckles. The rear axle is dead, rectangular in section. Two complete and independent brakes are employed, the service members of the contracting type on the jackshaft and the emergency on the rear wheels.

Poss, Poss Motor Company, Detroit. Chassis and panel delivery wagon, both of 100 pounds capacity. Motor is in front under a hood with driver and levers at the right. This is another new make employing the friction transmission.

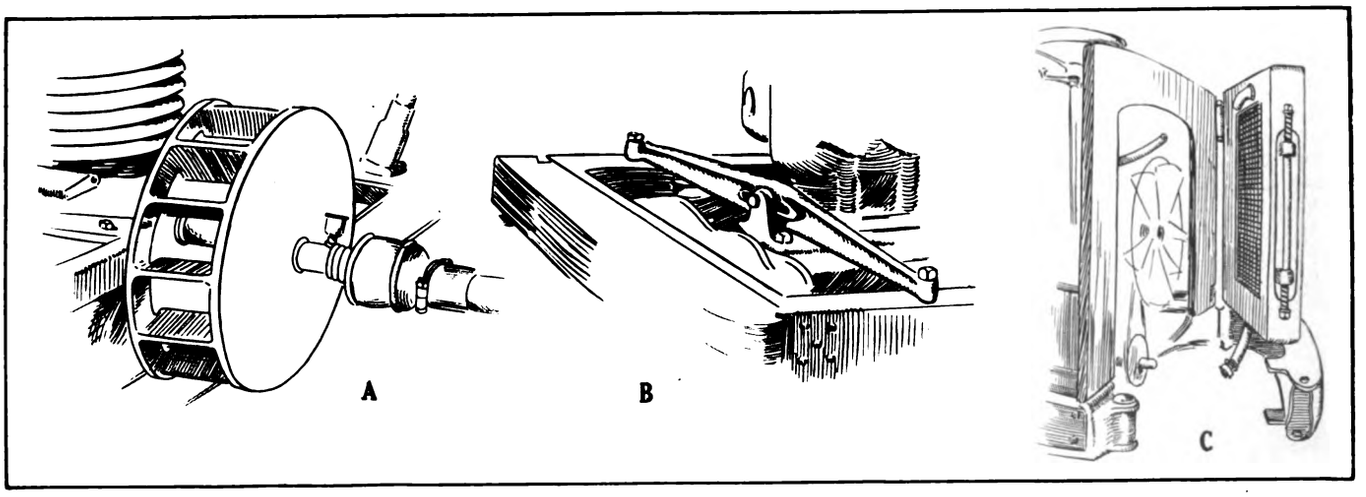
The motor is a four-cylinder, four cycle unit, with bore of 3.5 inches and stroke of 4.75, and cylinders cast en bloc. This is hung on brackets bolted directly to the main frame. The driving disc is carried in bearings in a cross frame and the shaft of the driven disc is supported on the main frame. Final drive is by single chain to the live rear axle, which runs on roller bearings. Solid tires are fitted as standard, although pneumatics may be had if preferred.

Rowe, Rowe Motor Company, Coatesville, Penn. One 1500-pound wagon with side seats and one 2500-pound high side box body with hand operated winch for handling stone. Motor is in front under a hood, with driver and levers at the right. While these cars are offered with a worm drive, these exhibited were not so equipped. In fact, it may be stated that the business of this concern is rather the manufacture of motors, and the production of trucks is undertaken on special order, the claim being that it is impractical to construct a line of stock models which will meet the varied requirements of individual users.

The motor is a four-cylinder, four-cycle, water-cooled, vertical unit, with inlet and exhaust valves on opposite sides. Extreme care has been taken in the design so as to protect all moving parts and bearings from dust and to prevent oil from leaking out. All attachments are so placed as to be easily accessible. Magneto, oil and water pumps are gear driven. Lubrication is by a self-contained system in the crankcase, circulated by gear driven pump, forcing the oil through ducts drilled into the crankshaft to each of the crankshaft and connecting rod bearings. Oil thrown off by the movement of the cranks lubricates the walls of the cylinders, camshaft and gears, valve tappets, etc.

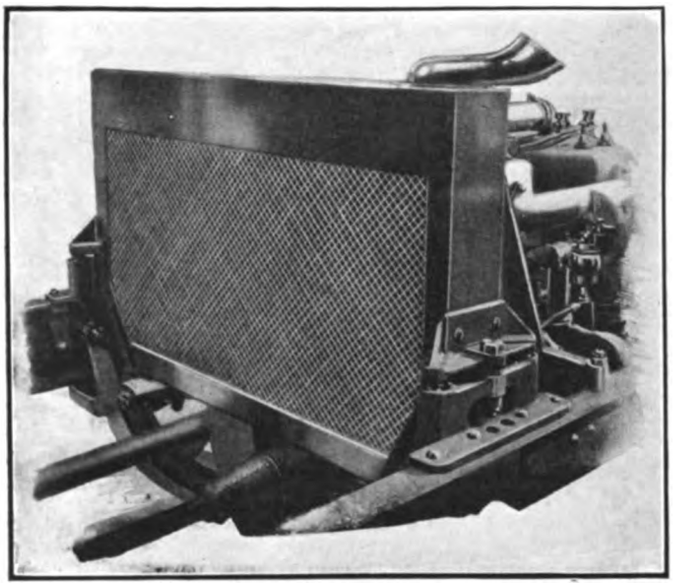
The multiple disc clutch runs in oil. The transmission is of the three-speed selective type. Two complete sets of brakes are fitted on the rear wheels. The service members are external contracting and the emergency, internal expanding. Frame is of pressed chrome-nickel steel, channel section. Springs are semi-elliptic in front and platform rear. As stated previously, final drive is by chain or worm, at the option of the purchaser, the choice being governed by the service which is expected of the completed vehicle.

Sanford, Sanford-Herbert Company, Syracuse, N. Y. Chassis, open flare board body and express, all of one ton capacity. Motor is under the floor, with driver and levers at the right. This make has been known as the Sanbert, the name being taken from those of the principal stockholders in the company, but the public has so often confused the name of the car with the first portion of the firm name that



A Few Mechanical Features at Grand Central Palace Display: A, Chase Fan Flywheel; B, Universal Motor Support; C, Knickerbocker Radiator Mounting.

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Radiator Under Driver's Seat on Universal.

it has been decided to accept that verdict and it will be known in the future as the Sanford.

The motor is a three-cylinder, two-cycle, air-cooled unit, with bore of four inches and stroke of 4.5, rated at 25 horsepower. Ignition is by Bosch high-tension magneto. The planetary change speed gearing is employed, and the gear-case is attached to the forward side of the jackshaft housing. Final drive is by side chains to the rear wheels, which are 38 inches in diameter, fitted with 2.5-inch solid tires. A belt driven fan furnishes air circulation when the motor is running.

Schacht, Schacht Motor Car Company, Cincinnati, O. One three-ton flare board express wagon. Motor is located in front under a hood, and driver at the left with centre levers. Although on the market for the past two years the Schacht was first displayed in New York at this show. The line also includes two and four-ton models, but in all essential characteristics they are the same. Few changes in mechanical construction are to be noted, the solid, substantial heavy duty type of vehicle with plenty of power and transmission systems well able to convey it to the rear wheels having demonstrated its satisfactory design under all circumstances in the past.

Sullivan, Sullivan Motor Car Company, Rochester, N. Y. Half-ton panel delivery wagon and 1500-pound flare board body. Motor is in front under a hood, and driver at the left with centre levers.

The engine is a two-cylinder, four-cycle, water-cooled, horizontal opposed unit, with bore and stroke of 4.5 inches, rated at 18 horsepower. This is suspended by cylinder head brackets from the main frame. Cooling is by thermo-syphon. Lubrication is by mechanically operated oiler, pumping oil to each of the cylinders, main bearings and direct to each connecting rod bearing. The crankshaft is drilled to allow the lubricant to be pumped to the latter. Valve operating mechanism is oiled by splash. Ignition is by Bosch magneto.

The transmission is of the planetary type. Clutch is of the cone type. Final drive is by side chains to the rear wheels. Brakes are equalized internal expanding members on rear wheel drums. Frame is of angle steel, hot riveted and securely braced at corners and with cross braces. Springs are full elliptic in front and full elliptic scroll in the rear. An auxiliary spring also is fitted at the rear. Tires are solid, 36 by 2.5 inches front and rear.

Universal, Universal Motor Truck Company, Detroit. Chassis and two warehouse trucks, all of three tons capacity. Motor is under the floor with driver and levers at the right. A particular feature of this line is the mounting of the radiator, which is behind the motor, on springs under the driver's seat.

The motor is a four-cylinder, four-cycle, water-cooled unit, with bore of four inches and stroke of 5.5, rated at 30 horsepower. Lubrication is by the self-contained, constant level splash system, from main reservoir to the plunger pump to sight indicator on the dash. Speed is controlled by an automatic governor of the ball type, acting directly on the main throttle control. Ignition is by jump spark, current being supplied by a Bosch dual magneto.

The clutch is a multiple disc of the dry plate type. Transmission is selective sliding, with three speeds forward and reverse. Final drive is by side chains to rear wheels. Frame is of steel, channel section. Service brakes are external contracting on brake drum located on the jackshaft and integral with the differential case. Emergency members are internal expanding in rear wheel hub drum. Four semi-elliptical springs are employed. Front axle is an I beam section, while the rear member is a heavy rectangular section. Wheels are 36 inches in diameter, fitted with five-inch single solid tires in front and four-inch dual in rear.

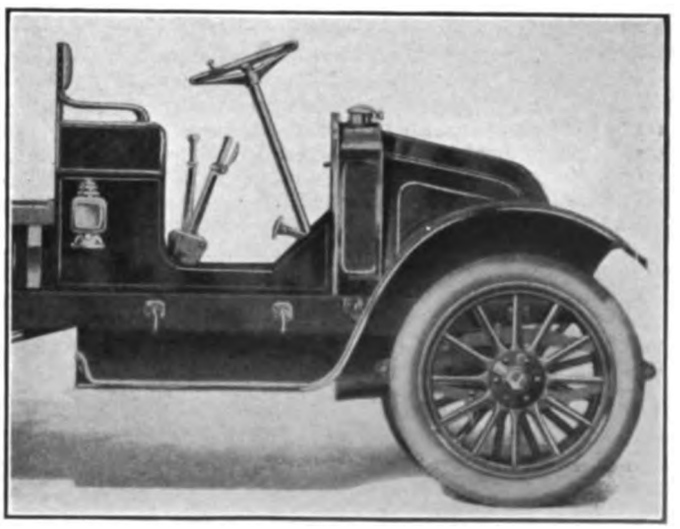
Veerac, Veerac Motor Company, Anoka, Minn. Chassis and carpet house wagon with high side panel and standing top, both of 1500 pounds capacity. Driver is located at the left with left hand levers. The name of this car is made up from the initials of the words, "valveless, explosion every revolution, air-cooled," and the power plant is accurately described thereby, it being a two-cylinder, two-cycle, air-cooled, horizontal opposed unit.

This is hung crosswise of the frame and has two separate and distinct throttles, one for each cylinder, controlled by two throttle levers on the steering column. This is held to make it possible to control the engine, either by throttling down one or both cylinders at a time, or cutting out one member and running the power plant as a one-cylinder motor. The throttle valves are at the intake ports of the cylinders, thereby eliminating the possibility of disturbing the action of the carburetor.

Another feature is the installation of a pipe leading directly from the gasoline tank to the cylinders with a shut-off cock operated from outside the frame. By opening this cock for a moment gasoline is injected into the cylinders and starting is thereby made easier, it is claimed.

Velie, Velie Motor Vehicle Company, Moline, Ill. Three-ton chassis, three-ton low stake body and 1500-pound delivery wagon. Motor is in front under a hood, with driver and levers at the right. Although by no means a new product, this was the first time it was shown in New York City. In the main, the construction follows standard design, incorporating only such features as have been tried out thoroughly and found satisfactory under all conditions. A Prest-O-Starter and governor are fitted as regular equipment this year.

One particular feature is the differential lock, by means of which it is possible to depress a pedal on the foot board and lock the mechanism so that the rear wheels turn as if on a solid axle. The design of the radius rod also is unusual. Instead of being rigid when subjected to endwise pressure, this is made with telescoping joints held open by

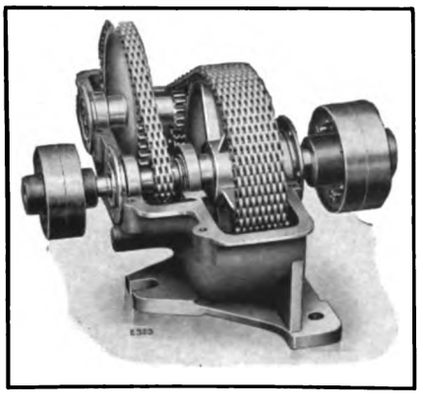


Radiator Behind Motor on Lippard-Stewart.

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heavy helical springs, so that the sudden application of power, instead of transmitting severe shocks, is cushioned.

Victor, Victor Motor Truck Company, Buffalo, N. Y. Two-ton warehouse truck. Motor is in front under a hood, with driver and levers at the right. Although the full line includes a number of models, few mechanical changes are noted over past years, the construction having been such that it has given abundant satisfaction under varying degrees of service. A multiple disc clutch is fitted as standard, although a cone clutch will be substituted if desired.



Speed Reduction Gearbox for Electric Motors.

Walter, Walter Motor Truck Company, New York City. Three-ton chassis, three-ton furniture wagon and five-ton chassis. Motor is under the floor with driver and levers at the right. The principal feature is the adoption of the new Westinghouse change speed gear mechanism, which will be standard in all future productions of the company.

In this, which gives three speeds forward and reverse, the gears always are in mesh and are engaged by individual clutches of the multiple disc type mounted on concentric sleeves, and operated by the progressive movement of a lever, which engages the clutches in succession. The first movement of the lever compresses the discs of the low speed clutch, which is caused to rotate, carrying with it a sleeve, on the opposite end of which is a gear meshing with a countershaft gear. Further along the countershaft another gear engages with a gear on the tailshaft, which is connected by a universal joint to the propeller shaft.

Further movement of the operating lever carries the compression further, and the second clutch is engaged, without releasing the first, however. The second clutch drives another sleeve inside the first, and it also carries a gear and drives the countershaft and tailshaft in the same way as the first speed gearing, the difference being that the gears in the second set are proportioned to give higher speed at the tailshaft.

In order to prevent locking, the driven gears on the countershaft are on roller clutches, so that when the second speed is engaged the first speed roller clutch overruns. On third speed, drive is direct, first and second gears on the countershaft overrunning on their roller clutches. When speeds are changed with this gear the transition from one to another is said not to be perceptible. The entire mechanism, including the clutches, is enclosed in a single casing, and the shafts and sleeves run on annular ball bearings.

ELECTRIC COMMERCIAL VEHICLES.

Argo, Argo Electric Vehicle Company, Saginaw, Mich. One 1000-pound chassis, one 1000-pound panel delivery, and one one-ton low side panel delivery. This new line was notable because of the manner in which the motor, a Westinghouse ironclad type, and transmission are combined in a unit. Drive is through a short shaft and herringbone gears.

The battery, provided to suit condition of use and preference of the purchaser, is underslung amidships. Control is located on the steering mast, interlocking with ratchet brake, so that the latter cannot be set with power on, or power applied with brake set. This is claimed to be a distinct Argo feature.

Hupp-Yeats, Hupp Corporation, Detroit. One screen side delivery of 1000 pounds capacity. This is a new addition to the Hupp-Yeats line, although the chassis does not differ materially from that of the well known pleasure vehicle of the same make, except that it is slightly changed in shape and somewhat heavier throughout.

Walker, Walker Vehicle Company, Chicago. One 750-pound chassis, one 750-pound screen side delivery, and one 1.5-ton panel delivery. Internal drive with all gearing enclosed in the disc rear wheels; a single electric motor with its shaft extending across from wheel to wheel, each end of the motor shaft driving a wheel, and a differential in the motor shaft are the principal features of the line.

The motor is enclosed in a hollow casing which forms the rear axle. On either end of the shaft is a small spur pinion which meshes with two large gears, the latter in turn meshing at diametrically opposite points, with a large internal gear secured to the inside of the wheel rim. The two intermediate gears turn on studs on opposite ends of the yoke, which is mounted on the end of the hollow axle casing projecting into the wheels.

Owing to the peculiar construction of this rear axle the motor is extremely accessible. The upper portion of the casing is removable, when six capscrews are taken out, and the whole of the motor with differential on the shaft, may be examined.

JANUARY GENERAL VEHICLE SALES.

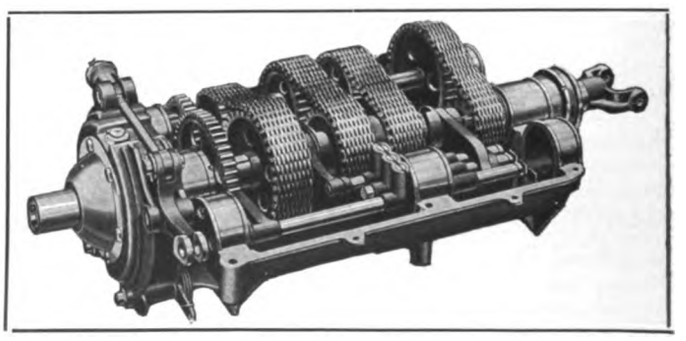
It will prove of interest to note that the January sales of General Vehicle electric trucks, made by the General Vehicle Company, Long Island City, N. Y., totalled 158. Jacob Rupert, a New York brewer, ordered 21, making his fleet 72 in all. Peter Doelger, another New York brewer, ordered eight, making a total of 47. Other large orders were: Muehlback, seven, making 10; Commonwealth Edison, nine, making 15; Schaefer Brewing Company, eight, first order; General Baking Company, 10, initial order. Sixty-nine per cent. of the 1911 business of the company was reorders, and Feb. 1 finds it with 671 General Vehicle electrics bought by 25 customers alone.

BRITISH CARS USE COVENTRY CHAINS.

There is a growing tendency abroad to adopt a noiseless chain for driving the camshaft, magneto and pump of the power plant and many of the best known English makes displayed cars thus equipped at the recent Glasgow motor exhibition held recently. Not only is the chain drive being utilized in the motor but also in transmissions, etc.

Among the exhibits of interest at the Scottish show was the display of the Coventry Chain Company, Ltd., Coventry, England, of which S. Hoffnung & Co., Ltd., 118 Broad street, New York City, is United States representative. The complete product of the British concern was shown, as well as a chain driven change speed gearbox which attracted considerable attention at the Olympia show and which is depicted in an accompanying illustration. This design makes for silence and efficiency and is being tested by American maufacturers with a view of application to their cars. In Germany a plant is being erected to produce the gearbox for supply to the motor builder.

The application of the silent chain to a speed reduction gearbox is shown in the illustration herewith and it is claimed that the design solves effectually the question of reducing speeds of electric motors to the desired number of revolutions with a minimum loss of power, by either double, treble or quadruple reductions. In addition to efficiency, silence, reliability and longevity are emphasized.



Coventry Noiseless Chains Fitted to Change Speed Gearbox.

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MIDDLE WEST AWAITS CHICAGO SHOW.

EACH year the importance of Chicago as a centre in which to make display of commercial vehicles has been appreciated more and more by the manufacturers. While there was some question regarding the advisability of holding a separate show for this type of automobiles in New York City in 1911, there was little doubt in the minds of those who had studied the field that the second attempt of this nature would prove successful in Chicago. It must be remembered, in this connection, that the metropolis of the Middle West was the first city in the country to inaugurate the scheme of holding an exclusive motor truck exhibition. But that was some years ago, when this branch of the industry had not as yet been fully recognized as a separate institution, and the attempt was largely in the nature of a failure. However, the industrial transport show of 1911 was a decided success from every point of view, and there is little question that the event which will be held in the Coliseum and First Regiment Armory, Feb. 3-10, will be even more so.

The second annual motor truck display will be under the auspices of the National Association of Automobile Manufacturers, and the direction of S. A. Miles, who has managed all of the automobile shows held in the Coliseum, whether these have been combined exhibits of pleasure and commercial lines, or of a separate character. The interiors of these two buildings lend themselves admirably to the decorative art.

It is announced that the treatment of the Coliseum will be purely architectural throughout. The girders will be hidden by a mosaic design, relieved here and there by mural paintings, the whole effect being light in color, white, amber and gold predominating. The two end walls above the gallery will be covered with immense drop curtains. The building will be lighted by 36 large chandeliers.

The main floor of the armory will be transformed in much the same manner as last year. Staff walls, pillars and vases of the Louis XIV design will be combined with flowers, foliage and ornamental lamps. For the first time, the ceiling will be flat instead of circular. A drop curtain running from the second to the third gallery will surround the entire structure.

There were 72 different makes of machines displayed at the two shows in New York City last month. Chicago will see no less than the same number, and all in one exhibition, albeit both structures will be utilized in the display of trucks this year, whereas the Coliseum was found wholly adequate for this purpose in 1911. Incidentally, it may be mentioned that this number is based upon advance reports, and it is known that several other makers have secured space within the last few days, so that the 1912 Chicago exhibit will be far the largest showing of industrial transports ever assembled in any city. There were 57 different concerns represented last year.

It is well to note that many makes will be shown which were not seen in New York. Included in this list are the following: Adams, Avery, Chicago, Clark, Diamond T, Dorris, F-C-S, Four Wheel Drive, Mais, Mercury, Monitor, National, Old Reliable, Rambler, Rassel, Service, Smith, Staver, Stegeman, Sternberg, United States and Wilcox.

SPLENDID SETTING AT MILWAUKEE.

The Milwaukee Automobile Dealers' Association, Milwaukee, Wis., held a combined showing of pleasure and commercial cars in the Auditorium in that city, Jan. 13-20. The interior of the building was converted into a garden within a wall, on which was entwined vines and Alabama smilax, making a decidedly attractive setting. The truck section was most complete in every way, practically every line represented in the city being shown. Despite the very cold weather, the attendance was most satisfactory, and it is understood that considerable business was transacted. The following concerns made display of power wagons:

Universal Machinery Company, Universal; Buick Motor Company, Buick; American Locomotive Company, Alco; Crown Commercial Car Company, Crown; Orrin R. Hughes, Garford; Jos. Obernberger & Sons Company, Monitor; Peerless Motor Car Company, Peerless; Brodessor Motor Truck Company, Brodessor; Curtis Automobile Company, Reo; Hickman-Lauson-Diener Company, Ford; McDuffee Automobile Company, Chase; D. F. Power & Co., Menominee; Johnson Service Company, Johnson; Packard Motor Car Company, Packard; Stegeman Motor Car Company, Stegeman; KisselKar Company, KisselKar; American Automobile Company, Pierce-Arrow; Bates-Odenbrett Automobile Company, White.



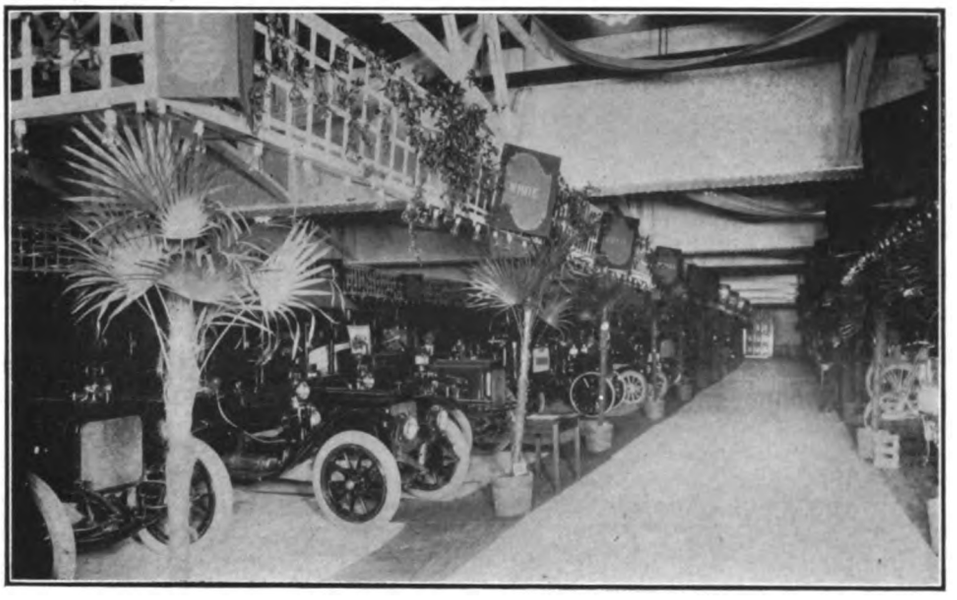
Exterior of the Coliseum at Chicago, Scene of the Second Annual Separate Show of Commercial Vehicles in Middle Western Metropolis.

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PLANS FOR BOSTON'S FIRST TRUCK SHOW.

INDICATIVE of the rapid development of the commercial vehicles is the separate display of business wagons which will be held in Mechanics' building, Boston, March 13-20. Until this year trucks have had a place in the pleasure car exhibit, but the progress of this branch of the industry has necessitated a separate show, the demand for space upon the part of the manufacturers leading the Boston Commercial Motor Vehicle Association to decide upon this step. The management is under the personal direction of Chester I. Campbell, as heretofore.

The unusually large attendance at the New York displays of commercial cars is a forecast of the success of the Boston event and it is anticipated that the Mechanics' building will be taxed to its utmost to accommodate the numerous designs. Many makers who were unable to secure space at the metropolitan shows will be represented at Boston. The entry list includes all types of commercial vehicles from the tiny parcel delivery wagon to the 10-ton truck, and machines designed for every industry will be represented, as well as automobiles for municipal service. The result of the careful study and experimentation of the manufacturer during the past year will be revealed in special bodies constructed to meet every requirement and these will include dumping bodies which are operated by the driver without the latter leaving his seat.



Attractive Exhibit of White Trucks in the Foreground of the Commercial Vehicle Display at Providence, R. I.

The rapid development of mechanically propelled fire apparatus will prove interesting to municipal authorities and as a large number of different types will be exhibited these will attract those considering the displacement of the horse drawn equipment. Army wagons, ambulances and omnibuses will be found in large numbers as well as numerous types of vehicles especially designed for light delivery work.

Not only has progress been made by the manufacturer in the refinement of body designs but a great many improvements in the mechanism of the machines will be noted. New ideas in transmission will be exploited as well as many ingenious devices, all of which make for reliability and economy.

The commercial vehicle show will be a splendid object lesson, and the business man will recognize the value of its economic side, to say nothing of the worth of the automobile in service. The indications are that the power wagon show will share equally with that of the pleasure car event in the matter of attendance and business transacted. That New England is a promising field for the development of the commercial car is recognized by the manufacturer, and the Boston show will afford him an opportunity to demonstrate the superiority of the automobile over the horse drawn equipment.

TOLEDO'S THIRD ANNUAL DISPLAY.

The commercial vehicles were shown with pleasure cars at the third annual exhibit of the Toledo Automobile Dealers' Association in the Terminal building, Toledo, O., Jan. 15-20. The exhibitors of motor trucks follow:

Atwood Automobile Co., Overland, Garford, G. M. C., Federal; Banting Machine Company, Grabowsky; Rambler Motor Sales Company, Detroit electric; Northern Ohio Motor Car Company, Brush; Blevins Auto Sales Company, Gramm; United Motor Toledo Company, Sampson; Roberts Toledo Auto Company, Ford; H. J. Adams, Reo; Grasser Motor Company, Lauth-Juergens; Shop of Siebert, Siebert; McCreery Manufacturing Company, Oliver; James P. Locke, Adams; Morrill Company, Kelly.

OPEN AIR EFFECT AT PROVIDENCE.

The State Armory in Providence, R. I., was utilized by the Rhode Island Licensed Automobile Dealers' Association for its revival of motor car shows in that state, Jan. 22-27. It is four years since the people of Rhode Island had opportunity to inspect the different models in an exhibition of this character, but this was the first attempt to hold a display under the direct management of the association. Its splendid success presages an annual event in the future. The decorations were such as to give the impression of an open air park, in which the vehicles were displayed with splendid effect. Much business was transacted through the week.

Those who made display of commercial vehicles were: White, Binford & Robinson Motor Car Company, White; Hitchcock-Banks Motor Car Company, Knox; Foss-Hughes Company, Pierce-Arrow; KisselKar Company, KisselKar; William Hughes Company, Reo; North End Garage, Chase; Pugh Bros., Morgan; American Locomotive Company, Alco; Autocar Sales & Service Company, Autocar; Alvan T. Fuller, Packard; B. F. & A. W. Hopkins, International Harvester; Davis Automobile Company, Gramm; Rhode Island Motor Car Company, Pope-Hartford; Teel Manufacturing Company, Teel-Woodworth.

EXHIBIT OF DETROIT DEALERS.

While trucks were shown in connection with pleasure cars at the annual display of the Detroit Automobile Dealers' Association, in the Wayne Gardens and annex in that city, Jan. 20-27, they made a most creditable impression. Inasmuch as the original structure was found too small to accommodate all who wished to make exhibit, permission was received for the erection of a temporary annex.

The following displayed power wagons: General Motors Truck Company, G. M. C.; Commerce Motor Car Company, Commerce; Ford Motor Company, Ford; United Motor Detroit Company, Sampson; Neumann-Lane Company, Pierce-Arrow; Havers Motor Truck Company, Havers; Motor-Wagon Sales Company, Motor Wagon; American Steam Truck Comany, American steam; Poss Motor Car Company, Poss; Grabowsky Power Wagon Company, Grabowsky; Seitz Motor Truck Company, Seitz; Durant-Dort Carriage Company, Best; KisselKar Company, KisselKar.

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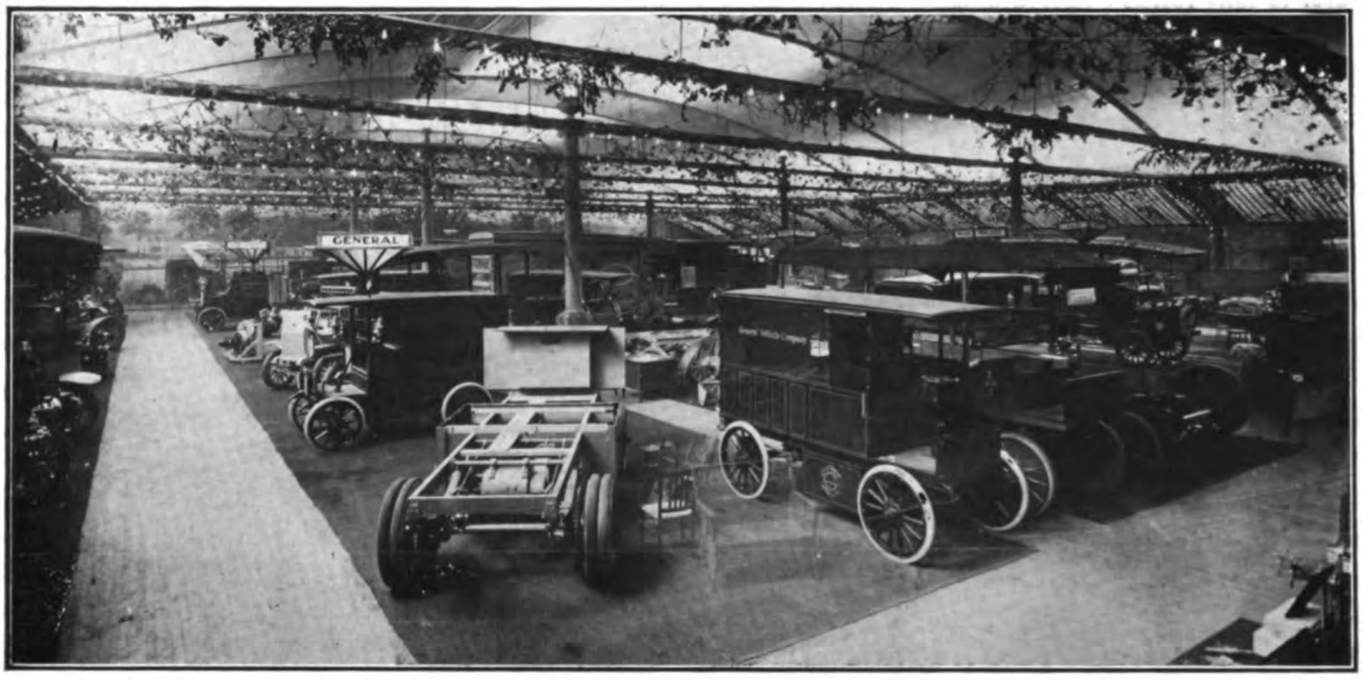
TWO BUILDINGS FOR PHILADELPHIA.

For the second time in the history of automobile shows in Philadelphia, a separate week was devoted to the display of commercial vehicles in the First and Third Regiment Armories, Jan. 22-27. In the former building the trucks shared the space with electric pleasure vehicles, and in the latter with accessories. The interior of each was handsomely decorated, and the fullest opportunity was afforded those who desired to inspect the mechanical features.

The makes shown in the First Regiment Armory were: Autocar, Brush, Cartercar, Commer, G. M. C., Gramm, Kelly, Mercury, Morgan, Peerless, Sandusky, Seitz and Speedwell. Those in the Third Regiment Armory were: Chase, Walker, Waverley, Mais, Commercial, Sampson, Pierce-Arrow, Alco, Knox, Packard, Reo, Philadelphia, Ford, Lozier, Baker electric, Cameron, Mack, Saurer, Locomobile, White, KisselKar.

WILL HANDLE COMMER TRUCKS.

Announcement is made by Wyckoff, Church & Partridge, Inc., New York City, that an agreement has been entered into with the Transportation Sales Company of that city which involves the purchase by the latter concern of Commer and Guy Vaughan cars to the extent of over $1,000,000. The new company will operate from the present location of Wyckoff, Church & Partridge, Inc., the latter retaining space in the same building for its general and executive offices. The plans of the new concern include the erection of a six-story building, in which will be installed a complete repair shop and service department. The structure will also include a large public truck garage with spaces and accommodations for at least 200 machines. A feature of the service will be an agreement to maintain free of charge for one year all repairs to Commer vehicles, tires and accidents being excepted. The Transportation Sales Company is composed of experienced automobile men and engineers fully capable of dealing with the New York situation, and its taking up the sales of Commer cars is in keeping with a plan outlined some time ago by representatives of the English product.



Interior of the First Regiment Armory During the Progress of the Power Wagon Exhibition at Philadelphia.

LUBRICATING THE COMMERCIAL CAR.

Inasmuch as the business world is rapidly recognizing the economy effected by commercial motor transports, it is essential to consider the matter of providing safeguards against delays and repairs to the vehicles which are called upon to perform such efficient and constant service. Operators of motor trucks sometimes are inclined to under estimate the attention necessary to be given to the mechanical features. There isn't the same "pride of appearance" feeling that exists with the chauffeur of a pleasure car, and as a result the entire truck may be made to suffer from inattention.

It is generally accepted that two-thirds of motor troubles, for instance, are caused by improper lubrication. This is a decidedly important consideration, inasmuch as the engine of a commercial vehicle is called upon to undergo heavy duty service throughout its entire life. It follows that it must necessarily possess wearing qualities, which cannot be retained without the very best lubrication, and in this respect the most satisfactory insurance against possible engine trouble is the proper selection of oil. It is poor economy to employ an inferior grade, simply because it is offered for less money.

Those who have made a careful study of the subject are agreed that the proper oil for motor truck lubrication should have, first of all, the right body or viscosity, and this must be such that it will not be affected materially by temperature changes. From the high heat of the cylinder to the lower in the crankcase, it must maintain a uniformity of flow and, at the same time, its lubricating qualities. It must have a fire test that will permit it to burn up cleanly after it has performed its function, and this cannot be accomplished if it contain free carbon. This latter can be removed only by a process of mechanical filtration which is expensive.

While there are oils on the market that will perform properly the services called for in a motor truck, the Havoline Oil Company, New York City, recently concluded practical working tests, which have resulted in the offering of a new brand under this well known firm name, to be known as Havoline motor truck oil. In the preparation of this, special attention has been paid to securing all of the qualities necessary for commercial vehicle lubrication. The guarantee of the Havoline concern should be sufficient to indicate that it is a satisfactory product for all requirements.

At the shows a very novel souvenir was given away at the Havoline booth. It consisted of a jig-saw puzzle which, when put together, portrayed an aeroplane, automobile and motor boat. When the puzzle is solved and delivered to one of the stations of the Indian Refining Company, 17 Battery Place, New York City, distributor of Havoline oils, the possessor is entitled to a valuable book of tours, compiled by an authority.

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SALES METHODS WHICH SECURE REORDERS.

By P. D. Wagoner, President General Vehicle Company.

ONE of the most encouraging features of the motor truck industry of today is the increasing number of large orders received by manufacturers. These indicate in a substantial way a recognition of the value of the commercial vehicle and a confidence in the present day product. Furthermore, as many of these large reorders are from consistent users of the truck or wagon in question, they indicate also that the customer is convinced, after a practical test, that his inital motor truck investment was a paying one.

Almost before we have had time to realize the keen, nation-wide interest in the motor truck many of our large firms are saying among themselves, not—"Shall we 'try out' a truck?" but—"How many trucks shall we buy?" There are many phases to this question of buying trucks in quantities, and I have always watched "first installations" with much interest.

It seems to me that other things being equal the size of the first order depends largely upon the ability of the buyer to fully realize on his investment. If the buyer is a large corporation with a well organized transportation department such as is common to our great express companies, department stores, packers, brewers, etc., a sudden and radical change can more safely be made in the method of delivery, because the organization is in a position to cope with the new conditions and requirements which arise. With the smaller buyer this is not always true and some caution in buying is necessary in order to avoid confusion and unnecessary expense in operating power vehicles. I believe all broad-minded business men will concede the fairness of this suggestion.



P. D. Wagoner, President General Vehicle Company.

The transition from the centuries-old method of horse and wagon delivery to the 20th century method of motor truck delivery should here be done systematically and step by step if real efficiency and economy are to be secured and maintained. Motor trucks should not be measured by horse wagon standards. And what is more important from an efficiency standpoint, the system behind the loading and routing of horse drawn wagons should be wholly reorganized and the pace accelerated when the faster and surer power vehicles, independent of weather and of flesh and blood limitations, are substituted.

With perhaps 40 per cent. of our output to date or, specifically, 1000 vehicles distributed among less than 100 customers, our reorder experiences have been very extensive. Over 69 per cent. of our 1911 output went to customers already using our vehicles. We attribute our success in selling fleets, or in getting reorders, which is the same thing eventually, to our policy of selling most of our customers, first, a nucleus to work with and to build a foundation, and, then, when they have thoroughly tried out, say from two to 10 cars and readjusted their delivery system to meet the changed conditions, putting in our vehicles in fleets and from 10 to 25 at a time until their existing transportation needs are comprehensively supplied.

Large orders can best be secured on a basis of mutual confidence, patience and co-operation. I believe the reason we do not have larger motor fleets in some lines of trade today is because in the too frequent ambition to sell a customer as many trucks as possible in the shortest space of time, due consideration is not given to the needs of his particular business in his particular locality or environment. If the selling organization interested would study to give each customer just the truck or wagon or the number of each which he needed at that stage of his conversation and facilities, we should see more satisfied customers at the outset and larger reorders later on. Progressive expansion is what is needed—not a wasteful upheaval of a delivery structure developed through years and years of gradually increasing business.

On the other hand the great truck fleets in successful operation today—and by the word "successful" I mean dividend-earning—are but a handful of what we will see in less than another decade. Shrewd, far-seeing business men are more and more being converted to the use of the motor truck and just in proportion to the proven value of the first, perhaps, very modest installation will their confidence grow and will they reach for their pen to sign reorder contracts. Hysterical, "hurrah boys" methods may sell pleasure cars to care free recreation seekers, but they are out of place in selling business cars, just as slipshod methods are doomed to failure in building business cars.

Motor truck reorders are inevitable with large firms provided the trucks first purchased—but still on trial from an operation viewpoint—are well built and adapted to the work involved, and the sales department handles the matter of additional trucks intelligently and in a spirit of fairness to the buyer. But create the impression, by over enthusiastic order takers, that the purchasing agent must go to his superiors and ask them to let him practically scrap, at once, the rest of his horse and wagon equipment and you may have retarded sales indefinitely.

We have given much thought to this matter and have doubtless lost many sales by waiting until in our opinion a customer has had time to balance his ledger and show a profit from his first small installation, just as we have lost sales by declining to build special trucks which we knew would prove impracticable and eventually dissatisfy the customer. On the other hand we have in some cases made a lasting friend for our product by counselling the too ardent convert to electrics to go slow and to order trucks only as fast as he could economically use them to supplant other equipment.

All of which emphasizes a growing impression among some truck manufacturers who have been building trucks for 10 years or so that selling motor trucks is a science in itself and that the most brilliant pleasure car salesman may sell but a few trucks and these to his firm's sorrow.

This is why I believe that sound engineering principles and workmanship evolving a standardized product, combined with intelligent co-operative sales methods will produce the bulk of motor truck reorders in the future.

UNITED STATES TIRE DATA.

Information relative to the tire problem is always of interest to the user of the commercial vehicle and prospective purchaser as well. An unusually attractive booklet has been issued by the United States Tire Company, New York City, and the brochure describes and illustrates in detail the new United States standard tire and demountable rim, which is manufactured for single or dual tread. This device permits of the removal and replacement of a shoe easily, thereby saving considerable time. Accompanying the booklet, which is printed in colors, is a card giving the standard tire and wheel dimensions for demountable and non-demountable solid motor tires adopted by the Society of Automobile Engineers, also the general dimensions of the product of the United States Tire Company.

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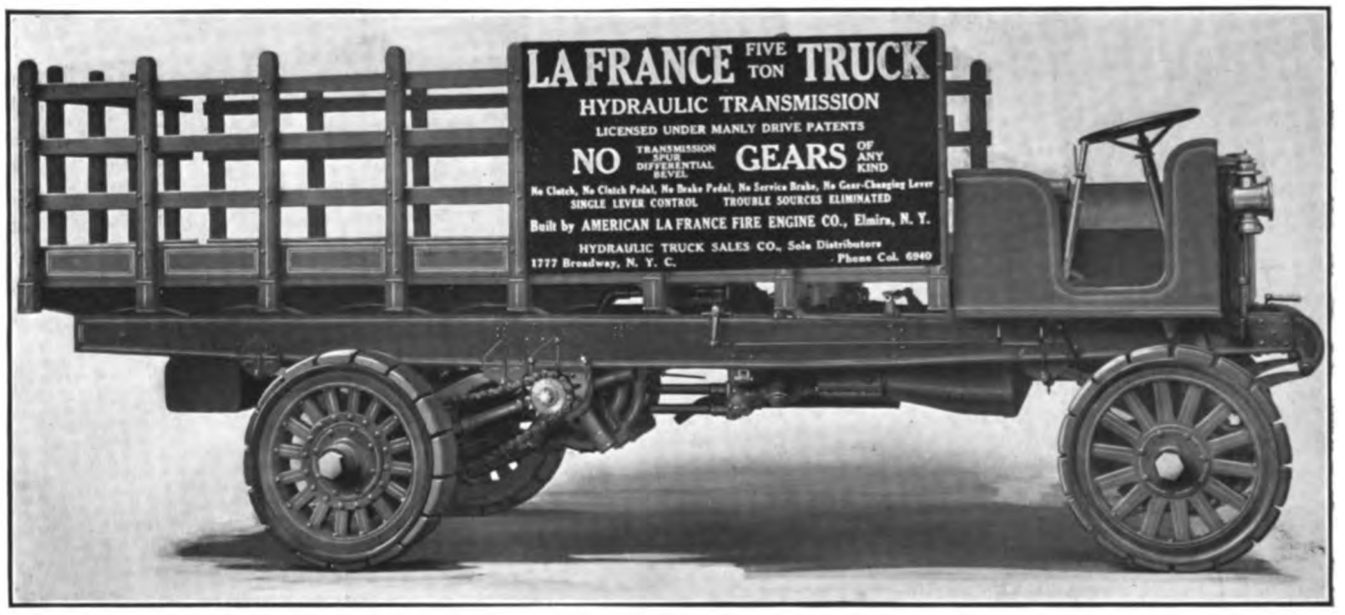
LA FRANCE GASOLINE-HYDRAULIC TRUCK.

Five-Ton Vehicle in Which the Clutch, Sliding Gears, Jackshaft and Differential Are Eliminated by the Use of the Manly Patent Transmission, Which Has Remarkable Flexibility and Greatly Multiplied Power.

THE use of a pump in which oil is the circulating medium, and the utilization of this pump by varying its capacity instead of changing the speed of the motor by which it is driven, this pump taking the place of the conventional gearset or transmission mechanism, is the feature of the La France gasoline-hydraulic truck. This machine is built by the American-La France Fire Engine Company, Elmira, N. Y., and the device is employed under a license for the patents granted to Charles M. Manly. The system is known as the Manly hydraulic transmission, which is an adaptation of the pump instead of gearing, the pump in turn driving oil through a construction termed motors, which are really actuated by the circulation of the oil, and these motors turning shafts on which are sprockets, from which chains transmit the power as with any normal form of side chain drive to wheels revolving on a dead rear axle.

It will be seen that the construction as it is in these trucks eliminates the usual form of clutch, change gearbox, the drive shaft, the jackshaft and the differential. The power delivered at the traction wheels is dependent upon the flow of oil through the motors, which are of the cylinder and piston type, and this flow is varied by changing the length of stroke in the pump cylinders from zero to the fullest capacity. With the usual form of power reduction by change of gear ratio there are distinct steps, ordinarily three in a forward movement, and but one for a backward movement of the vehicle. It is true there is a considerable variation possible in the engine speed, but when running slowly the motor does not develop its normal power, and to race the motor means deterioration. The hydraulic drive is intended to afford a constant engine speed and utilization of the full power at whatever ratio may be necessary to obtain the desired vehicle movement.

In connection with this form of power transmission it might be said that it is in effect a parallel of steam in that there need be no gradations of increase or reduction. One of the greatest qualities of the steam engine is that the precise power needed for a work may be exerted to the maximum capacity, the only effect of an overload with a steam engine being to stop it, just as gravity will overcome velocity when a cannon ball is projected into space. Any steam engine of good design will withstand an overload of from 50 to 200 per cent. for a limited period, and from the imaginary nothing to this extreme any power may be used. This power is dependent upon the engine speed. With the gasoline motor reasonable movement must be obtained to develop power and between the points where efficient energy is developed and where there is no possibility of damage, let us say from 800 to 1200 revolutions, for example, is the range of variation. This is as broad as good practise would dictate. It will serve for illustration, however. Between these points the engine may be varied, but to obtain an ideal it ought to be maintained at 1200 revolutions, we assume. Were this done we would have simply the three speed steps, which we will further assume to be one-third and two-thirds of the engine speed and direct drive. There would also be the reverse of one-sixth engine speed. To get wider power variance we accelerate or lessen engine speed, with consequent variation of power in a far different manner than might be assumed. To apply the power slower we increase the leverage through gearing, and when used this leverage relieves the engine of a part of its load and it will increase its speed materially. With lessened vehicle speed the motor speed is generally increased and the motor will acquire speed as its load is diminished or the leverage is increased by gear reduction. But under any circumstances the work is by steps or within certain limitations which do not obtain with the steam engine.



The La France Five-Ton Truck in Which the Manly Hydraulic Transmission Takes the Place of the Conventional Driving Mechanism.

Steam has enormous expansive force and great elasticity. Fluids cannot be compressed and therefore have little elasticity, but it is possible by forcing them through orifices of varying proportions, as from a cylinder by a piston, to produce a cushioning effect that may be estimated with great exactness and to cause certain results. For instance, in the utilization of this principle the recoil of heavy naval guns has has been entirely absorbed and shocks of tremendous force very largely eliminated, or at least brought well within the limitations of the gun mounts. This has been accomplished by a system of cylinders filled with glycerine in which are plungers or pistons. In the pistons are series of channels or grooves that are tapered with the smallest end nearest the muzzle of the cannon. As the

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gun is fired the mount is driven backward and against the cushion of glycerine by the recoil. The fluid is forced into the grooves and flows toward the other end of the piston, but as the volume that will pass from the smallest ends of the grooves is dependent upon the force of the recoil, and as a greater quantity of glycerine will enter the largest ends in a given time than can flow through the smaller ends in the same period the impact of the explosion is sustained upon the glycerine. The fluid begins to pass through the grooves as the piston moves and as these constrict the velocity of the flow increases but the volume is no greater. The impact or shock is at maximum when the piston begins to move and as the piston moves backward its velocity decreases gradually until it stops. It is possible to compute with a certainty every factor entering into construction and operation of such a device.

With the hydraulic transmission as constructed under the Manly patents the principle of the recoil absorbing device is reversed. It may be defined as a system of pumps, motors and piping which is filled with oil. The pumps force the oil to circulate through the system and the rapidity of movement of the motors is dependent upon the velocity of the circulation of oil. The motors must be of maximum capacity and for that reason the power generated is absolutely dependent upon the speed at which they are driven. The slightest movement of the oil must have an effect upon the motors. The impulse may be made by the passing of a very small quantity of oil through the motor, and the shafts may turn but a single degree, but this impulse has a positive power value and a definite force.

As it is regarded as imperative that the vehicle engine should be driven at or as near a constant speed as it can be adjusted to develop a given power, and as the oil motors must have a stated capacity, the flow of the oil is not varied by the speed of the vehicle engine but by varying the capacity of the pumps. The pumps must have variable capacity, and as a series of pumps would result in establishing power steps as with a gear reduction, this variation has been obtained by changing the stroke of the pump. It is possible with the Manly system to adjust the pumping pistons so as to pump any desired volume of oil through the motors, from a fraction of an ounce to piston capacity, so that while the vehicle engine may be driven at a given velocity and the pumps to an exact number of revolutions each minute, the circulation of the oil may be theoretically from zero (and practically nothing) to a maximum volume, or even reversed.

It is well enough known that gases may be compressed to liquids, but not beyond that point. Under some conditions in the use of the motor wagon it may be necessary to stop quickly, in fact to stop the pumping of the oil circulation. This would mean stopping the motors and there would necessarily be increase of the pressure in them. This has been compensated by a valve that will open when the pressure of the oil has reached 2000 pounds to the square inch, and the oil will flow through this until the pressure falls below 2000 pounds. The normal pressure forcing the oil circulation is estimated to be 400 pounds, so that when this has been increased five times the safety valve releases the excess and there will be a slight movement of the motor corresponding to the difference in the pressure upon the oil, but the excess oil is thus passed from the regular circulating system around the motors to another point in the system between the motors and the pump, thus practically equalizing the pressure to 2000 pounds or less. It might be pointed out that while these pressures have been fixed upon as giving a satisfactory result these may be changed to meet any requirement. They may be less or more or with differing relations, but in practical service these figures have been established as meeting such conditions as might arise.

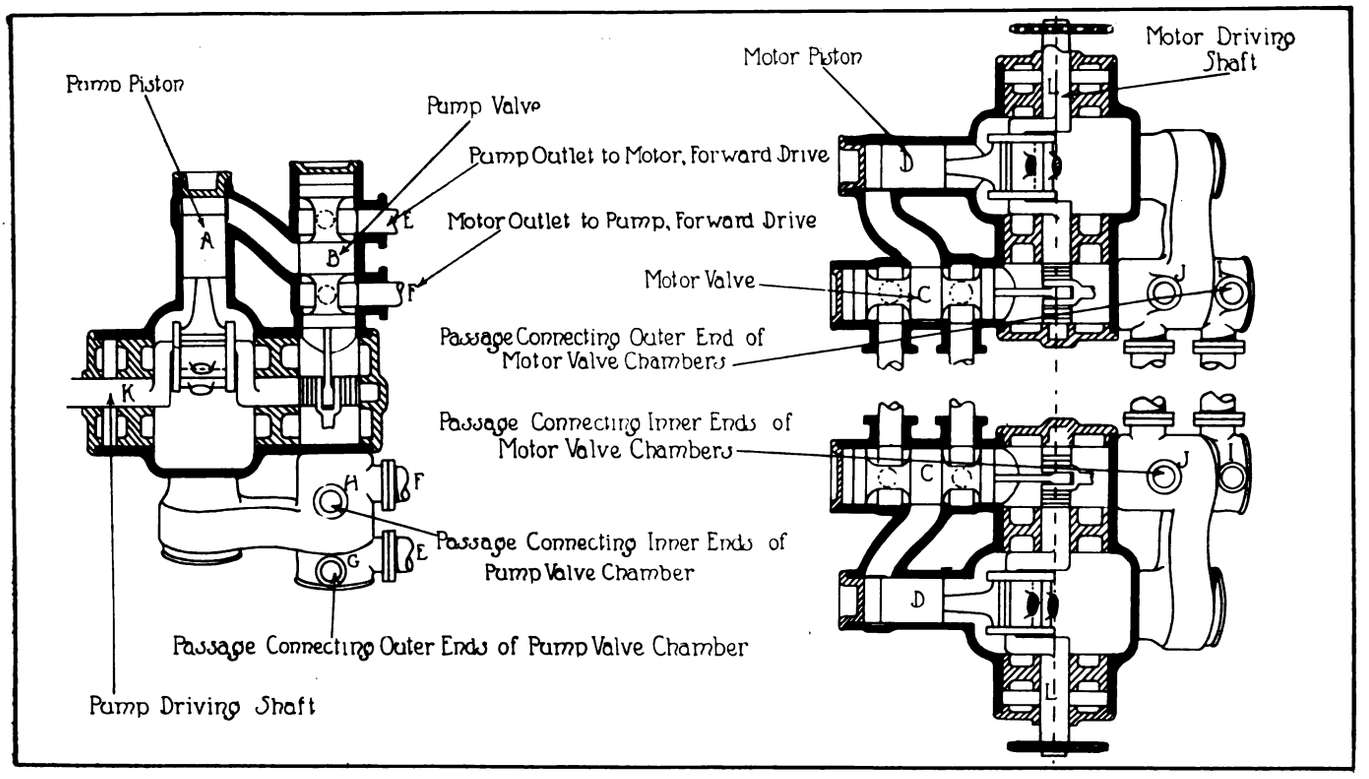


Fig. 1—Drawing Showing the Manner of Installation of the Hydraulic Transmission System, the Pump Transverse of the Chassis Frame and the Motors and Shafts Serving as the Conventional Jackshaft to Drive the Rear Wheels by Double Side Chains.

Reference has been made to the increase of power by slowly applying it by gear reduction, and with the Manly system there is a similar increase possible through the exercise of greater pumping capacity, for the pumps can be driven to the safety valve limit of 2000 pounds and the oil forced through the motors at that pressure. As the pumpage through the system may be varied at any pressure the motors may be made to move very slowly and with extreme power. Estimating this power to be in direct ratio to the increase in pressure in the oil system it may be regarded as 400 to 2000 (the limit allowed by the safety valve) or five times. With the engine running at a constant speed there is then the variation of oil circulation from zero to 2000 pounds to the square inch, which affords a margin very much in excess of all probable requirements.

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In fact there is so wide a range that it parallels the steam engine for variability, elasticity or flexibility, for any one of these terms will fairly well represent the quality.

In considering the possibilities with this form of drive or transmission it may be well to contrast it with the conditions to be met with in the service wagons generally in use. This is with reference to the construction and the result of continued operation. Any shaft driven vehicle must have power transmitted through worm or bevel gears. There is a degree of friction transmitting power at angles that cannot be overcome. Without specifically detailing this frictional loss of power, which must be apparent in the new machine, there is no question that it is materially increased as the mechanism wears. This may be said to be begun at the motor itself, due to a perceptible degree to the irregular torque or movement of the engine, and this may be followed through the clutch, the transmission, the shaft and universal joints and the differential.

Theoretically a double side chain drive has the greatest efficiency so long as the chains are well cleaned and lubricated and the sprockets are not badly worn. But with the system that may have an initial efficiency of 96 (the maximum of expectation), the loss may be as high as 33 per cent., approximately. Of this about 10 per cent. may be attributed to universal joints with shaft driven machines. The remainder is to be distributed through the system. Contrasting the side chain driven types there is little probability that this loss will differ much with either form of transmission so far as the chains are concerned, but there will be a decided gain in the Manly drive because there is a minimum wear with a motor driven at constant speed, and there is the elimination of the clutch, the universal joint between the clutch and transmission, the transmission, the universal joint or joints of the driving shaft, and the differential gear of the jackshaft.

As the Manly system of pumps and motors operates in oil which at a pressure of 400 pounds must penetrate to and between every surface in frictional contact it will be seen that there is but little wear probable. Every moving part of the pumps and motors is constantly bathed in oil and the harder the work the greater the certainty of lubrication. There can be no failure of lubricity under any circumstances. There is in the Manly system eight gallons of oil in circulation in the pumps and motors.

The power required to move a load from a standstill is much greater than is required to draw or pull it. As is well known, it is easier to draw a load than to push it. That is why practically every form of transport is drawn instead of pushed along. With the motor wagon the vehicle is pushed and to overcome its anchorage a much greater effort is necessary to start. This is the reason for applying power slowly and obtaining greater leverage when starting a truck or wagon, changing to a higher gear ratio and lesser power application when the movement has been begun. With the steam vehicle the power is exerted slowly, from the imaginary nothing. With the conventional transmission the start is made on the low gear ratio. With this form there is more or less strain upon the engine and the engine cannot be driven to its greatest efficiency when the delivery of power is most needed. When the truck is loaded it must subject the power plant to the greatest stresses in starting and in climbing grades where it is necessary to change to a lower speed. With the Manly transmission the full power may be utilized at any time and under any circumstances, with the least strain upon the motor.

While the La France truck has abundant engine power - -it is rated at 48.4 horsepower by the S. A. E. standard - it may not be necessary to utilize but a part of this, and there is a reserve that may be applied when desired. The power is generated by a conventional gasoline fuel motor of the four-cylinder, four-cycle, vertical type. The cylinders have a bore of 5.5 inches and stroke of six inches, are of the Arriob type and are cast in pairs. The maximum speed is fixed at 1200 revolutions a minute. This engine is carried under a hood between the seats for the driver and the helper and it is cooled by a radiator at the front of the chassis, the water being circulated by a gear driven pump, and drafts from the fan mounted on the forward cylinder and driven by a belt from the camshaft extension, and from the fan-blade spokes of the flywheel. This statement is made to emphasize the fact that the truck has power that is at least equal to other vehicles of its class, aside from the fact that it has the qualities specifically stated. In other words, it is possible to utilize any degree of its engine power to the limit and then beyond this to the limitation of the oil motor system safety valve.

There is nothing in any way unconventional with the truck save in the transmission or driving system, which, while known to many engineers, is not generally familiar to those well versed in motor vehicle mechanics. For this reason a somewhat more detailed description is given, which is supplemented by three drawings, one of these being without reference to proportions and merely serving to illustrate the manner of installation of the transmission. It should not be considered as more than a suggestion at best.

By reference to this sketch it will be understood that it assumes a mid-section of a chassis frame, showing the end of the driving shaft that is coupled with the engine crankshaft. This driving shaft is carried in an installation or mount and coupled to this is the device that controls the oil pump. Examination of the illustration of the truck itself will show that this mechanism and the oil pump form practically one assembly that is carried between two cross members of the frame. The pump consists of a housing that shows the five cylinders in which the pump pistons

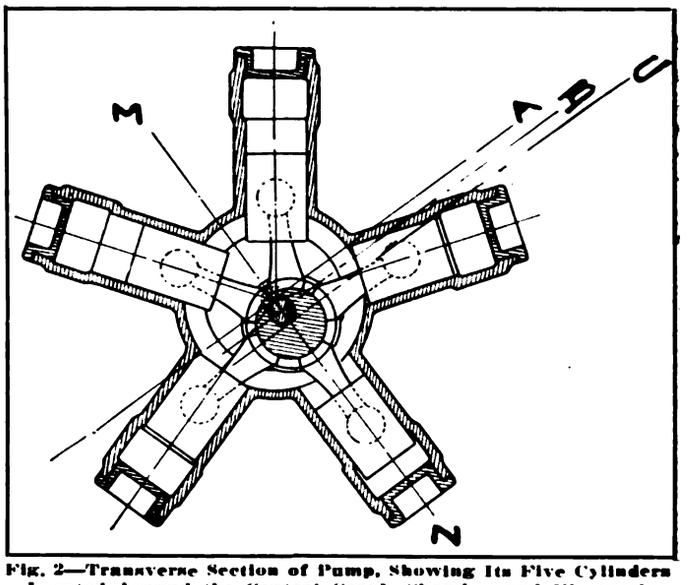


Fig. 2—Transverse Section of Pump, Showing Its Five Cylinders Located Around the Central Crank Chamber and Illustrating Method of Varying Stroke of the Pump Pistons.

or plungers are arranged radially with reference to the driving or pump shaft, and that paralleling these cylinders are the five valves or cylinders through which the oil is forced by the action of the pistons. In the operation of the pump each piston is in turn actuated as the driving shaft is revolved and the stroke being variable the oil is forced through the valve and into the piping to the oil motors.

Further examination of the illustration of the truck will show that there is at either side of the truck a single oil motor assembly, which are operated in unison, as the oil is normally pumped to each motor in precisely the same volume and speed. As the oil is forced through the oil motors it is carried back to the pump and while the truck is moving there is always a circulation of oil. It is possible, however, by circulating the oil from the pump around the motors to move the truck by turning the starting crank, or it may be pushed about the garage, for instance, by hand. Each oil motor has its own independent driving shaft and in turning a corner the motor at the outside will move more freely than that at the inside because of the lessened resistance, this condition being practically the same as might be found with a differential gear, though driven from the outside instead of the centre of a divided rear axle.

The pump is a decidedly interesting mechanism and it is possible to fairly illustrate it by reference to Fig. 2,

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which is a cross section of the pump cylinders and does not indicate the valve system or the manner of oil circulation through the pump. It serves to demonstrate the method by which the length of stroke of the pump pistons is controlled. On the pump driving shaft is a bushing or sleeve and the connecting rods of the pump pistons are attached to this bushing. Referring to Fig. 2 it will be seen that the line M-N passes through the centre of the pump driving shaft, the centre of the eccentric crank of the pump driving shaft and the centre of the eccentric pump driving shaft bushing as they are shown in sketch. The line A intersects the line M-N in the centre of the pump and the centre of the pump driving shaft. This is also the centre of rotation. The pump driving shaft has an eccentric crank whose centre is shown where the line B intersects the line M-N, and the eccentric pump driving shaft bushing has a centre where the line C intersects the line M-N. The eccentricity of the bushing is equal to the eccentricity of the crank. That is, the line B is equi-distant from the lines A and C. This eccentric bushing can, at the will of the operator, be rotated about the eccentric crank of the pump driving shaft independently of the rotation of the pump driving shaft itself.

In the position shown the stroke of the pump is equal to the eccentricity of the pump crankshaft plus the eccentricity of the bushing, and is at maximum. If the bushing were rotated about the crankshaft through the angle of 180 degrees the line C would coincide with the line A, the bushing and the pump driving shaft thus becoming eccentric, so that the pump would have no stroke at all. The different positions between these two extremes give different strokes, and since any position of the bushing may be established, any stroke of the pump can be obtained, which, of course, means any speed for the pump, the motors and the truck. The rotation of the crankshaft bushing from the position of maximum stroke to no-stroke position is accomplished through the use of an auxiliary piston, lying parallel to the shaft, and supplied with power from the fluid pressure of the pump. The piston operates on the bushing through appropriate mechanism. It is under the control of a pilot valve which is actuated at will by a hand lever. Briefly the double-eccentric action makes possible the variable character of the pump stroke.

Referring again to the illustration of the truck it will be noted that there are two pipes between the pump and the oil motor, and through one of these the oil flows to the motor and through the other is returned to the pump. When the pump is reversed, and it has a reverse capacity of a quarter of its forward pumpage, the circulation is correspondingly changed. The oil motors may be operated to capacity in either direction and with equal power production, the only limitation being the pump.

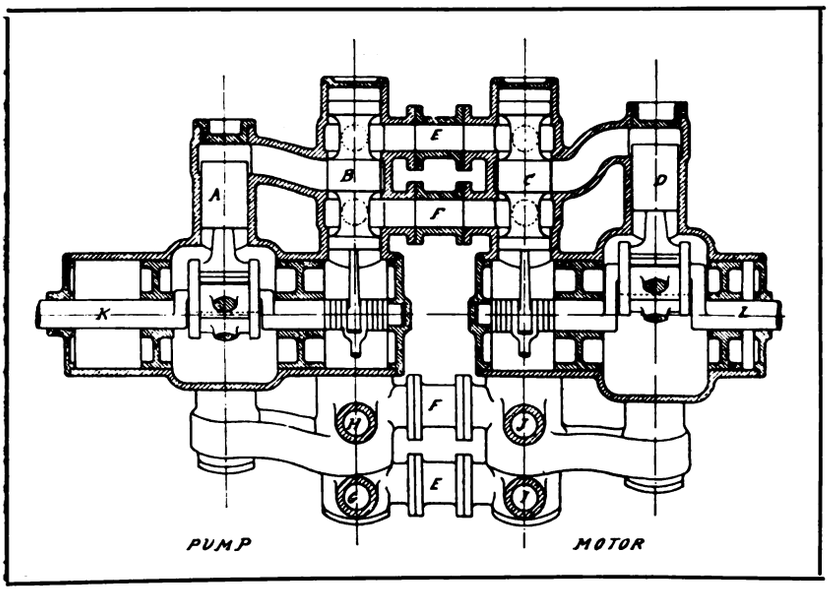


Fig. 3—Sectional View of Pump and One Motor Connected by Piping to Illustrate the Circulation of the Oil in the Manly Hydraulic Transmission.

For the further illustration of the system attention is directed to Fig. 3, which shows a pump at the left of the assembly and a motor at the right. These are not the positions they have in the installation in the truck, the vehicle illustration showing that the driving shaft of the pump is at right angles with those of the motors, the piping being of considerable length. This sketch shows, however, the cylinders and valves of both pump and motor and the pipes connecting them.

Considering this drawing it will be seen that A represents the pump pistons and B the pump valves. Passages extend from the head ends of the pump cylinders to the centres of the corresponding valve chambers through which the oil is forced by the pump strokes. C represents the valves and D the pistons of the oil motor, there being similar passages extending from the centres of the valve chambers to the head ends of the motor cylinders. The passages are connected by the piping, which is shown by E and F. One pipe carries the oil from the pump in the one direction, and after the oil has passed through the motor it is returned in the opposite direction. The outer ends of the five valve chambers of the pump are connected by the circular passage G and the inner ends of the chambers by the circular passage H, and in a similar manner the outer and the inner ends of the five valve chambers of the motor are connected by the circular passages I and J. K represents the driving shafts of the pump and the motor. The motors are identical with the pump save in variable stroke and size. This operation as illustrated is for the regular or forward movement of the pump. For reversal the pump stroke is first passed through the zero point of the stroke and then the valves change and the oil is simply pumped in the opposite direction through the ports and the piping of the motors.

When the motors are driven forward the pipe E supplies the motor with the oil forced by the pump, while the pipe F returns it to the pump from the motor, thus answering the purpose of an exhaust pipe. When the pump is reversed and the motor is driven backward, the pipe F becomes the supply pipe under pressure and the pipe E becomes the exhaust pipe, the direction of the circulation of oil through the connecting pipes becoming completely reversed. Should there be a sudden change in the speed of the vehicle or the pump quickly reversed the momentum of velocity in one direction is taken up by the transmission system. That is to say, the pump being idle the oil resists the movement of the motors to a pressure of 2000 pounds, when the bypass valve will be opened and the oil will then flow beyond the motors, but not through them. Naturally this resistance to movement is as strong a brake as is the movement of the engine a source of energy.

In this system no definite statement has been made as to the maximum power that may be exerted by the vehicle engine. It is a perfectly established engineering law that by hydraulics any force can be multiplied any number of times, but the greater the resultant force the slower the movement. With the La France truck 6500 pounds has been determined as the maximum tractive effort that can be employed without undue stresses upon the vehicle itself. This was determined by a test in which two spring scales were attached to the rear end of the truck and to a stationary object. The truck engine was started very slowly and the pump action reduced. When each scale indicated 3250 pounds the pressure of oil was such that the bypass valve was opened and the fluid was circulated with the truck at a standstill. The valve had been set at 2000 pounds. This test having established a satisfactory margin the standard of pressure was adopted as 2000 pounds, for this cannot be exceeded by the operator and there can be no possible damage when this pressure is reached. The actual maximum is the bursting point of the piping and the pump and motors. The tractive effort always available is sufficient to carry the truck, weighing 8000 pounds, with a load of 12,000 pounds, a total of 20,000 pounds, up a 14 per cent.

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grade with snow hub-deep. It will be seen that this capacity is equal to any demand that might be expected, and far more than would be required in the conditions for haulage usually met with.

Now as to the efficiency, the makers will guarantee that this will be 87 per cent. of the useful power developed by the vehicle engine. A series of tests were conducted by George H. Barrus, an independent consulting mechanical expert, under four different conditions. These were as follows: Series A, with the circulating oil at medium temperatures, the driving shaft supplying constant power at constant speed, the driven shaft receiving constant power at varying speed; series B, with the circulating oil at medium temperatures, the driving supplying varying power at constant speed, the driven shaft receiving varying power at varying speeds; series C, with the circulating oil at maximum temperatures, the driving shaft supplying constant power at constant speed, the driven shaft receiving constant power at varying speeds; series D, with the circulating oil at maximum temperatures, the driving shaft supplying varying power at constant speed, the driven shaft receiving varying power at varying speeds.

Series A tests at 363 revolutions a minute of the driven shaft gave 85.3 per cent. efficiency; 250 revolutions gave 89.4 per cent., and 140 revolutions 85.7 per cent. Series B tests at 352 revolutions gave 86.2 per cent., 264 revolutions gave 88.4 per cent., and 112 revolutions 83.1 per cent. Series C tests at 350 revolutions gave 87.4 per cent., 270 revolutions gave 91.9 per cent. and 163 revolutions 87 per cent. Series D tests at 350 revolutions gave 87.4 per cent., 245 revolutions gave 90.9 per cent., and 105 revolutions 81.6 per cent. In these the highest number of revolutions may be regarded as maximum. Naturally the highest efficiencies were when the circulating oil was most heated and consequently more fluid. The efficiency ranged from 81.6 to 91.9 with the transmission, the average being 86.8.

There are many elements that make for economy entering into the use of this form of transmission. The constant speed motor is the most economical form that can be used, and with this type it is possible to use other and less expensive fuels, such as kerosene or even heavier hydrocarbons. Besides this it is possible to control such form of engine without spark adjustment and there need be no carburetor adjustment other than at the carburetor itself. This eliminates all control elements to the lever by which the transmission pump stroke is varied, which is located on the steering column. By the movement of this lever the truck may be handled to the fraction of an inch, a matter of extreme importance when space is limited. As a matter of fact a governor which will eliminate any other control is recommended by the builders. By merely turning the engine crank the transmission pump is transformed into a hydraulic jack of enormous power. This may be utilized if necessary to move the car. It is also possible to lock the two driving shafts of the motor so as to cause equal tractive effort with both rear wheels. The truck may be operated by the man who knows nothing about conventional forms of transmissions. Every complication so far as the driver is concerned is eliminated.

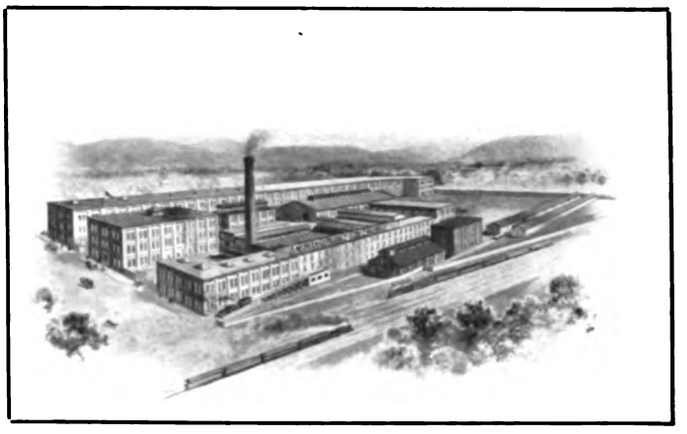
As a matter of fact the truck may be driven at all four wheels by this form of power if desired, and this power may be also utilized to steer the vehicle, and for hoisting dumping bodies, etc.

The other details of the truck are interesting because the construction is designed for especially heavy work. While normally rated at five tons it is held that it will safely stand an overload of another ton. The deck of the truck is 14 by six feet, giving 84 square feet of loading space. The platform is four feet above the ground when unloaded. The overall length of the truck is 18 feet 11 inches and the width seven feet 2.5 inches, with wheelbase of 143 inches and clearance of 12 inches. The overhang of the body is five feet three inches. The tread is 66 inches forward and 68 inches at the rear. The turning radius is 45 feet. The weight of the chassis is four tons, the maximum speed forward is 12 miles an hour, and the maximum reverse speed is three miles.

Some detail has been given concerning the vehicle motor which has force feed lubrication to the bearings and splash for the engine interior. The ignition is by Bosch magneto, dual, with fixed spark. The radiator is of the cellular type. The gas is ordinarily controlled by a foot accelerator.

The chassis frame is of pressed alloy steel channel section 9.5 by three inches by 18.75 inches, not trussed, but is built with numerous cross members and heavy gusset plates. The springs are semi-elliptic, 42x3.5 inches forward and 48x3.5 inches rear. The rear axle is dead, three inches, square section; the front axle is four by 2.5 alloy steel I section. The wheel bearings are Timken roller. The wheels are of wood, artillery type, and the tires are the Kelly-Springfield sectional, 36 by five forward and 38 by nine rear. The radius rods are 2.5 inches in diameter alloy steel. The emergency brake is expanding on the rear wheel drums and is operated by a lever at the right side of the driver. The gasoline tank capacity is 22 gallons and the oil capacity a quart.

The principle of the transmission is not new, but its application is. The first device of this character used was installed in a two-ton wagon in January, 1907. This vehicle has been used for demonstration purposes and yet no changes or repairs have been made in the transmission during the period of service. It has been driven more than 8000 miles with no load of less than two tons. The Bethlehem Steel Company is building 62 of these transmissions, for use on the new 28,000 tons Argentina battleships for turret turning and gun pointing. The system is covered by eight patents and 20 applications that are pending, all being owned and controlled by the Manly Drive Company, New York City. The American-La France Fire Engine Company, which has been for more than 35 years one of the best known builders of fire apparatus in the country, is building these trucks under license. The Hydraulic Truck Sales Company, New York City, has been organized and incorporated to market this production.



Plant of the American-La France Fire Engine Company, Elmira, N. Y., Where the Hydraulic Truck is Built.

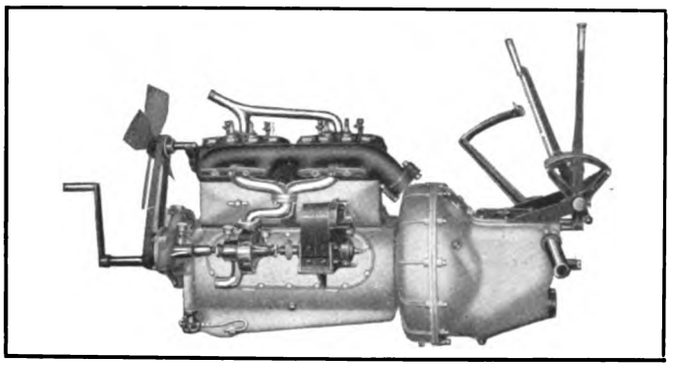
"TRUCKS RELIABLE," SAYS WILLYS.

"The commercial vehicle has reached the advanced development of the pleasure automobile," says John Willys, president of the Willys-Garford Sales Company, distributor for Garford commercial and pleasure vehicles, "notwithstanding the fact that some are of the impression that the business wagon has not progressed as rapidly as the lighter car. This is due, in a measure, to the fact that the former has not participated in as many spectacular contests. The early experiments of the power wagon were in the nature of private tests, but were, nevertheless, more exacting than those of the other type of machine. To prove that the commercial vehicle could withstand as gruelling a strain as the highest type of pleasure car, they have accompanied the latter in tours and endurance contests as baggage carriers, and in these runs performed consistently, maintaining the schedule of the other machines. The business wagon of today is so reliable and rugged and trustworthy that it will carry its load anywhere. There is no question that the motor truck has arrived."

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NEW HAZARD MOTOR CATALOGUE.

The new catalogue issued recently by the Hazard Motor Manufacturing Company, Rochester, N. Y., will appeal to



Unit Power Plant Produced by the Hazard Motor Manufacturing Company.

automobile engineers as well as those interested in the subject of power plants. It is not only a beautiful piece of printing, but the descriptive matter fully gives in detail the construction of the Hazard motor. The book is unusually well illustrated, depicting as it does, different power plants for commercial vehicles, also the special reduction box on the rear end of and integral with transmission, a new feature for use on heavy cars utilizing shaft drive. This arrangement provides an additional reduction of 2.5 to one, although different ratios are made.

The accompanying cut, which is a reproduction, the first employed in the catalogue, depicts the complete power plant which consists of a four-cylinder, four-cycle motor with three speeds forward and reverse selective type of transmission, in one unit, connected by a multiple disc clutch of 16 hardened, tempered and ground steel plates running in oil, operating clutch and brake pedal. All specifications of the product of the company are fully illustrated, making it of value as well as interest to the reader. Copies may be secured by addressing the company.

FACILITATES LOADING LUMBER.

To make motor trucks profitable in the lumber industry long waits must be avoided while the material is being assembled. Where the loads consist of various sizes of lumber considerable time is consumed in making up the order. During this period the power wagon must be kept busy hauling, and to allow this a movable platform is utilized which permits of shifting the load from one vehicle to another, an operation which consumes but a few minutes.

In the accompanying illustration is shown the device employed by the Curtis & Pope Lumber Company of Boston which concern maintains a fleet of White cars, made by the White Company, Cleveland, O. One of these is depicted beside the vehicle fitted with the platform and the positions occupied, if the latter were to be transferred to the automobile.

While the power wagon is delivering the other vehicle is being loaded in the yards, being hauled by horses. When the car returns it is operated into position beside the loaded wagon and the load shifted. In order to carry long pieces of material the raised frame of the device is fitted with rollers, the forward member being elevated which permits the transportation of long beams as well as making easy their unloading. In addition the load can be balanced perfectly. The entire arrangement makes it possible to produce maximum results.

BILL TO LIMIT TRUCK WEIGHTS.

Those connected with the motor truck industry, as well as commercial vehicle users, will be very much interested in the outcome of a bill introduced into the Massachusetts Legislature, limiting the weight of automobiles employed on the highways. While the full text of the proposed legislation has not reached this office, it is understood that its provisions are such that it practically would prohibit the use of trucks of more than two tons capacity. There is little doubt that the public hearings on the bill will be attended by those who appreciate the value of modern transportation methods, and it seems hardly probable that Massachusetts will place the law on the statute books.

IMPORTANCE OF SERVICE STATION.

During an informal luncheon given by C. P. Coleman, president of the International Motor Company, New York City, in that city recently, at which were present heads of the various departments, agents, etc., Mr. Coleman spoke of the importance of the service station, its maintenance and the necessity of having competent trouble men and inspectors connected therewith. The address teemed with many interesting features pertinent to the commercial vehicle industry.



Lumber Loading Device Utilized by Boston Firm Which Permits of Shifting Load to Truck Without Loss of Time.

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PRACTICAL MOTOR TRUCK BODY DESIGNING.

Sizes Regarded as Capacity Standards, from Which Estimates Are Made and the Differing Constructions Created—How the Components Are Specified and the Materials Are Selected and Prepared for the Assembling.

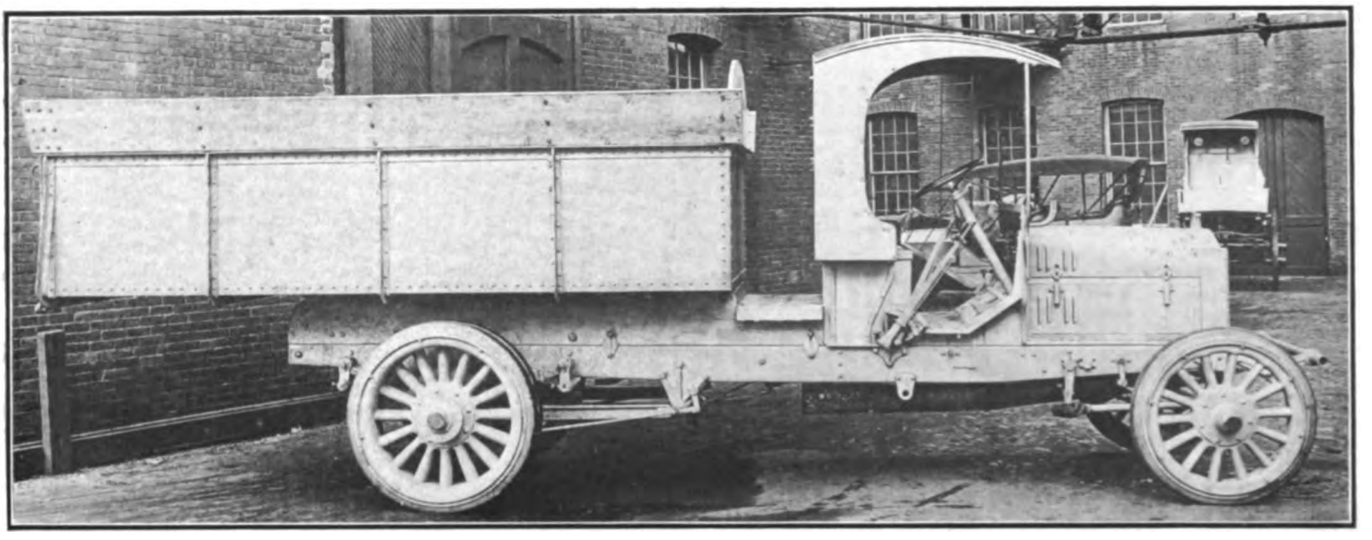
By William W. Scott.

THE acceptance of certain types of animal vehicles as standard, and then the manufacture, first of components and later of complete conveyances, created recognized dimensions that have been adopted generally. It is possible, for instance, to purchase all the parts necessary for practically any form of construction, even to fittings, hardware, and the like, so that a type of wagon or cart may be built or assembled by a hundred different workers and yet differ slightly, if at all. This condition had the effect of standardizing horse transports and this has led to the assumption that we must accept as fundamental the dimensions of these conveyances. Standardization is a manufacturing convenience and necessity, but what may be regarded as standard for one form of production may not be satisfactory, or even suited, for another.

In the construction of motor propelled wagons there are many conditions arising which are so radically different from those obtaining with animal service that one may express surprise that there has not been quite as great revolution in design as in power. In power wagon engineering different lines of effort have been followed and while these have been in practically every direction so far as mechanics are concerned, few have been bold enough to consider from a scientific viewpoint the matter of hauling loads without reference to animal conveyance design. It is true that highways and open areas for shipping and receiving, buildings and the like, have created or arranged for horse service, but the original adaptation of power plants to existing wagons has led to accepting these wagons and carts as the limitations for motor transports.

It is also a fact that with the advance of mechanical engineering as applied to automobiles there has been little attention given to spring construction or design, and while it is admitted that there is greater need of improved suspension and running gear there has been comparatively small progression. The increased speed, the greater stresses and heavier road shocks, have brought about heavier constructions, but there has been no especial change in form, as might be logical with a certain need of load equalization with reference to wheels, with need of minimizing the height of the centre of gravity of the load, and to insure against stresses on account of the careless arrangement of the load.

Just the proportions of the load and its location on the chassis must be problems for the designer to solve, and these must govern the form and size of the body and the weight that may be carried in it. It is obvious that chassis design differs widely. With some the construction is to bring as much as 33 per cent. of the freight weight upon the front axle, and this ratio may lessen until as much as 95 per cent. of the load is carried upon the rear axle. With some the centre of the load may be very close to the rear axle and, with others, even behind it. It is understood, of course, that the distribution means when the chassis is level and the load properly placed. It may be assumed that overloading may be permitted, but while it is not impractical to vary slightly from the capacity limit it is apparent that when the load of a power wagon is not equally distributed there is considerable more stress on the construction, at least a different stress, and with the increase in the height of the load these stresses are also multiplied.



Five-Ton Pierce-Arrow Worm-Driven Truck Equipped with Steel Body with Flare Boards for the Transportation of Coal—This Installation Has Capacity for More Than the Normal Load, But Can Be Used for the Haulage of Other Materials.

Low Centre of Gravity Necessary.

For this reason it is desirable to bring the centre of gravity of the load as low as it can be with the design. While the tread of the vehicle may be 72 inches with some machines, with few exceptions it is necessary to carry the body above instead of between the wheels, and to insure wheel clearance when the springs are compressed the body must be sufficiently high. The condition is much different than is experienced with the animal vehicle where the load may be carried on heavy dead axles and entirely between the wheels, without spring suspension that is susceptible to overloading. Overloading of the animal conveyance is generally responsible for wrecks, but the animals can and generally will stop when the work is beyond them. There is no indication of overloading with the truck unless it is the sagging of the springs or the appearance of the tires and for this reason the limit is made for weight of freight. The manufacturer of the chassis protects himself by a guarantee, as does the maker of the tires, and it is expected that the conditions against overloading shall be lived up to. Then it is essential that the owner of the vehicle shall for his own protection regard the limitations placed upon the

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machine. It is obvious that were the construction such that 25 per cent. of the load were carried on the forward axle and 75 per cent. on the rear axle, a change from these proportions to 35 and 65 respectively would be dangerous. As loads will vary so much in weight it is impossible to produce a general service body that may not at times be overloaded.

It is certain enough, however, that the chassis builder has surrounded himself with all the safeguards that are consistent and it is further required by the majority of manufacturers that there shall be no changes in the chassis. This means that while a chassis frame may be shortened, for instance, there can be no change in the mechanical construction, as to the relation of the axles, the transmission, etc. Should there be changes then the guarantee is violated and the owner destroys whatever protection he may have had had he preserved the chassis as constructed.

As the owner must conform to the requirements of the manufacturer and the general design of the vehicle he has but one other reccurse and that is the type of body that he can install. While there may be needs that are urgent it is a fact that the body builder will know all the pitfalls and will be able to make a construction that will conform to all engineering requirements and give the necessary facilities.

Sizes of Standard Body Types.

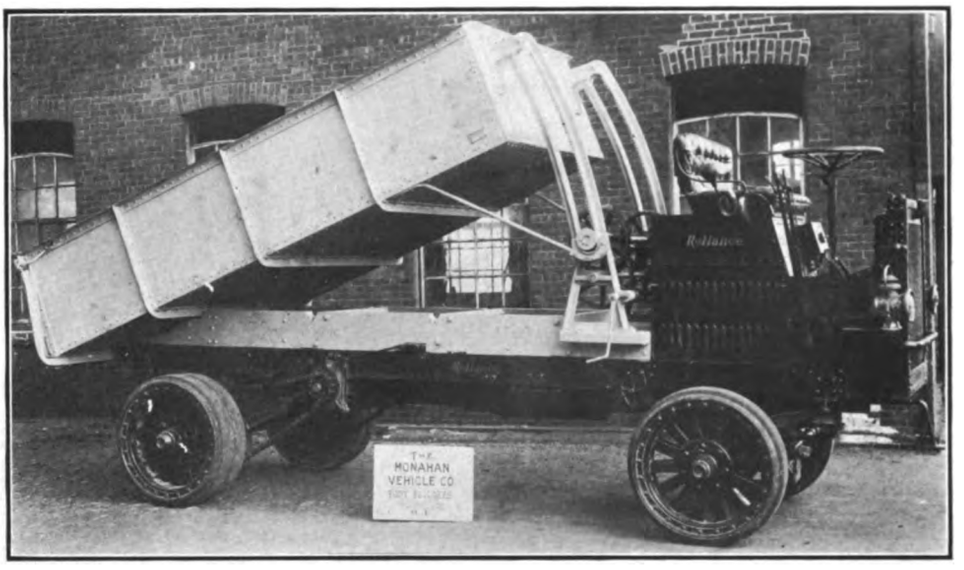
In the building of motor vehicle bodies, both open and enclosed, there are certain sizes that are regarded as regular, these, perhaps, being accepted because of animal vehicle proportions. These dimensions relate to floor area or space and are, of course, subject to variation:

Weight of load, lbs.	Size in Inches	Area, Sq. Ft.
1,000	96x54	36
2,000	108x56	42
4,000	126x60	52.50
6,000	144x72	72
8,000	156x72	78
10,000	172x76	90.75

It will be seen that there is necessarily a considerable increase in depth as compared with floor area to give the varying capacities. For illustration, there is an increase of 16.66 per cent. of floor in the 2000-pound body as compared with the 1000, and 100 per cent. increase of floor in the 6000-pound body as compared with the smallest. Yet there is a considerable excess capacity of the 1000-pound body which, with a depth of 12 inches, would have space for not quite a ton of bituminous coal, or practically 100 per cent. overload. And coal is by no means the heaviest form of load that may be hauled. It will be noted as well that the 10,000-pound body has a floor area of about 120 per cent. more than the 2000-pound body. This indicates that the capacity is obtained by increasing the height or depth of the body, and consequently the height of the load and its centre of gravity above the surface of the roadway.

How Gravity Centre of Loads Are Changed.

Taking a truck of five tons capacity as an example it will be understood that were the load of metal equally distributed on the deck or floor, centre of gravity would be low and the body space could be comparatively small. Were the load of stone the space would need be increased proportionately. As the load were varied and became more bulky it would be found that the body would necessarily be larger and the centre of gravity raised. Taking cases of cloth or the like a load might be piled eight or 10 feet above the floor and instead of being pyramid form might be stacked so that on a comparatively slight angle there would be a heavy side stress that would be greater and more severe than would the effect of a freight of decidedly greater weight with centre of gravity carried low. A full load of metal might be equally distributed as to weight in precisely the proportions intended by the designer, and yet the same weight of lumber might have stress entirely different. This being so it will be realized that while one or a few loads would not have material results, constant use under such conditions would eventually have destructive influences. The truck instanced, it will be recalled, was designed to carry five tons and for use with the load carried within estimated limitations. Obviously the floor area ought to be increased as the loads to be carried become bulkier to minimize the height of the centre of gravity of the load, but it is apparent with the increase of body floor there is no variance of the chassis dimensions.



Reliance Three-Ton Truck Chassis with Patent Steel Body Hoisted in Full Dumping Position, Showing Bolster on Which the Installation Is Carried.

It is a fact that wheelbase will increase materially with power wagon capacity, but the tread will not widen proportionately. The evident intention is to carry the load by increasing its proportions in length. The best illustration of this is that chassis frame width will vary from 36 to 45 inches, this being the extreme from the lightest form of delivery to the heaviest truck, while the wheelbase will range from 80 to 164 inches. The tread will increase from 56 to 72 inches with the wide forms of dual tires. With the conventional forms of bodies the width will vary from 46 inches for the enclosed delivery to 78 inches for the open truck equipment, but it is evident that the load of the smallest may be 500 pounds and of the largest perhaps 15,000 pounds, this being an increase of 69.5 per cent. in width and 2000 per cent. in capacity.

The body may be a plain platform with stakes and chain for the haulage of packages, cases, barrels, etc., or it may be with a body 12 feet in length, 66 inches wide forward and 78 inches wide at the rear, 30 inches deep and with flare boards that will increase the height to 40 inches, giving a carrying capacity of eight tons when the load is of coal and heaped. When bodies are built for carrying furniture they may be 174 inches in length and 72 inches in width, with depth of 15 inches. When the bodies are longer than this they are not regarded as regular or standard, but are special.

It may be said that requirements as met with in bodies are sometimes very widely varied and that larger bodies have been installed on 4000-pound wagons than on 10,000-pound chassis, this because of the load being light and bulky.

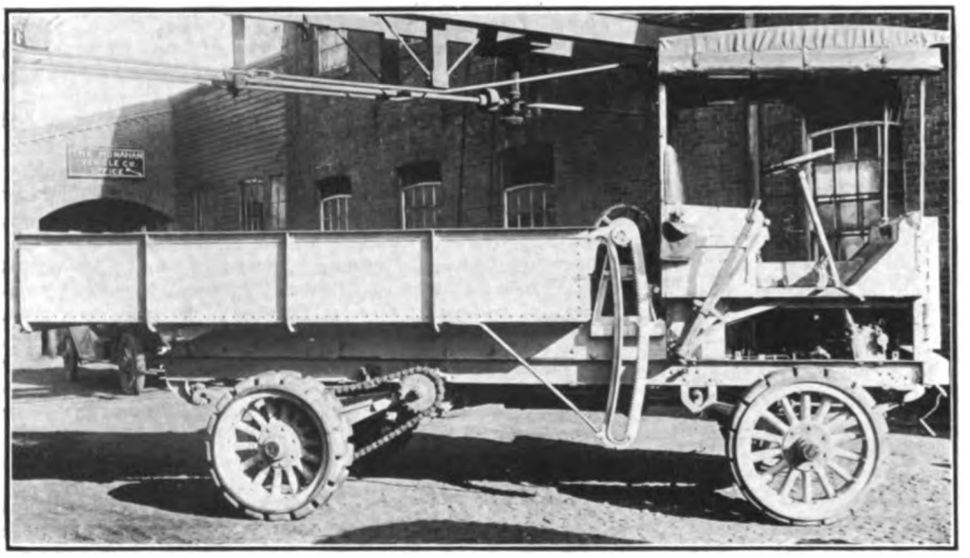
Though the argument may not be acceptable to those who desire to economize (from their own viewpoint) it is undoubtedly a fact that in choice of a body it is far better to consider the uses and select that which will afford the advantages and avoid the disadvantages. It is not judicious to assume that what can be packed on a body should be a reasonable load. Body space is not a measure by which to determine capacity and skyscraping loads are to to be

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discouraged without reference to the class of vehicle.

Problems for the Designer to Solve.

These problems are for the designer and he must be guided by the chassis dimensions and the uses to which it will be devoted. This being so then it is essential that the chassis be examined, studied and analyzed, the proportions of the load to be carried on each wheel and each axle learned, the dimensions of the chassis frame noted, the requirements of the owner ascertained and the weight and the bulk of the proposed capacity load determined. With this data the size of the body necessary is arrived at and its position with reference to the chassis is established. Thus far no chassis have been built suited to carrying loads that are extremely long, such as lumber, metal rod, poles, and other commodities, for which special horse equipment is necessary. This means that to place a load of lumber 20 to 24 feet in length on a chassis with a body 12 feet in length, with overhang of four feet back of the rear axle, would carry practically all the weight on the rear construction, an exceedingly dangerous condition. Thus lumber 16 feet or less is the longest that should be carried in such a body. Neither is it practical to have the load extend greatly beyond the side members of the chassis, 16.5 inches being the greatest allowance for such extension by the most careful designers, and then only with bodies that would not have a load more than 36 inches above the truck floor. These are examples of the limitations to be found with chassis of regular models. It is probable that instances of this character may be cited with reference to practically every type of machine.



Three-Ton Alco Truck Equipped with Patent Steel Dumping Body with Monahan Patent Hoist, Designed for Coal, Contracting Material and Lumber.

The body designer takes nothing for granted. He is exceedingly careful to have accurate note and record. He must be as precise as an engineer or an architect, and he must have ability to produce whatever may be desired in ornamentation and to combine dignity and utility at least pleasingly.

Body construction for motor vehicles has as a basis skill in drafting, knowledge of materials, and precise note of the designer's requirements as to the chassis. It is thoroughly practicable for the experienced man to take a blue print of a chassis and to produce a body that will not only be exact as to installation, but will be in every way adapted to load limitations. But it is imperative that every detail of the chassis be known, even to the location of a rivet or bolt head. Once a body has been built for a specific chassis the work may be repeated with this model as often as desired, but the slightest change must be of record. One of the most confusing conditions is the change in chassis detail from time to time by the manufacturers, which necessitates constant revision of record.

Assuming that a chassis has been selected for a work and the purchaser has consulted the body builder, it is desirable, but not necessary, that the chassis be delivered to the maker. If the chassis is not received, a blue print must be sent to the builder, this giving a plan view and a side elevation. With the chassis the special blacksmith work may be fitted, but with the blue print this work may be constructed to specification.

Sketches and Working Drawings.

First the side elevation of the body is drawn to scale and then a half, cross or end section is laid down, although often a full section is prepared. Sometimes the drawings are of the side, with the half front and the half rear elevations, together with a half bottom view. The chassis is shown in dotted and the plan in solid lines. Occasionally the entire vehicle is shown in the plan. In the plan every piece of material is indicated and to proportion, and note is made of the number and the dimensions of each member. If the vehicle is covered frequently a half top or whole top, or a whole or half bottom view is given. The plan will show the location of each screw, rivet, bolt, brace, band, mortise, tenon, strip, post, panel, pillar, sill, bolster, stringer, molding, board or other component. It will show the exact size of each according to scale, and the relation of the one to the other so far as these should appear in the side, end, roof or bottom elevation. In the making of the drawing, which is the complete assembly, there must be exact knowledge of the dimensions and proportions of each part. When these facts are noted it is possible for the designer to take them and make up the total from which the drawing is prepared. In other words the drawing is not possible until after every necessary fact has been established.



Alco Three-Ton Truck Chassis Fitted with Three-Compartment Tank, Designed for the Delivery of Gasoline, Lubricating Oil and Kerosene.

The first work is a sketch and from this the estimates

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are made and then comes the preparation of the specifications. In body building of recent years metal has been utilized to some extent for work that must endure, and this

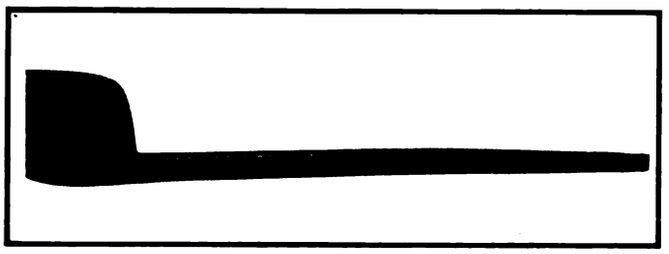


Fig. 1—Roman Front Platform Truck Body.

practise is extending, especially where the loads to be carried are heavy and the handling of the packages will quickly wear the wood. Metal sheathing has given way to heavier metallic construction because every element of strength may be had through the use of angles and tees and there is no possibility of deterioration from expansion and contraction of the wood through exposure to the elements in the course of the daily work. Not only this, the cost of wood has become almost as great as ordinary metals and it is procured with the greatest difficulty. This comment is interpolated to emphasize that knowledge of the value of metal in body construction is as necessary as of woods.

Preparation of Specifications.

In any sketch or draft that is made the body is usually drawn in connection with the chassis to illustrate appearance. This also makes it certain that the proportions are correct. To illustrate, the specifications for a working draft of a motor ambulance and casket wagon require the following parts:

Parts	Timber	Thickness, ins.	Width, ins.	Length ft.	Length ins
Bottom Frame of Body—					
2 Side sills	Oak	1.87	5.5	8	3
2 End cross bars, front and rear	Oak	1.87	4.25	3	5
4 Inside cross bars	Oak	1.25	4	3	5
4 Bottom boards	Oak	.63	9	7	7
Pillars and Posts—					
2 Coupe pillars	Ash	5.5	.	5	6
4 Side door pillars	Ash	1.75	.	5	4
2 Hinge door pillars	Ash	1.75	.	5	4
10 Inside posts	Ash	.87	.87	5	6
2 Rear end corner posts, curved	Ash	1.67	5.67	5	6
4 Rear door pillars	Ash	1.75	.	5	4
Rails, Cross Bars and Curves—					
2 Top rails	Ash	1.37	3.5	11	3
1 Front cross top rail	Ash	1.37	2.5	3	11
1 Rear cross top rail	Ash	1.87	5	4	4
4 Side rails	Ash	1.62	.75	5	11
4 Door rails	Ash	.87	2.25	2	.
4 Fence door rails	Ash	1.13	4	2	.
4 Bottom door rails	Ash	1.87	3	2	.
4 Door strainers, curved	Ash	.50	1.75	2	3
1 Coupe pillar cross top rail	Ash	1.75	5	4	4
1 Coupe pillar fence cross rail	Ash	1.13	4	4	2
1 Front centre pillar	Ash	1.75	.	5	2
1 Windshield curve	Ash	1.13	2.5	4	2
12 Other top curves	Ash	.87	.87	4	5
Panels—					
2 Bottom side panels	Poplar	.37	22	6	.
2 Belt rail panels	Poplar	.37	6	6	.
4 Upper panels	Poplar	.37	18	6	.
4 Belt rail door panels	Poplar	.32	6	2	.
4 Lower door panels	Poplar	.32	22	2	.
4 Top panels	Poplar	.32	14	12	.
Glass frame stuff	Ash	.565	1.87	50	.
Body moldings	Poplar	.37	.87	70	.
Drip moldings	Ash	.75	.75	35	.

Many Parts in a Standard Body.

It will be noted from count of the components that 90 are specified besides the stock for the glass frames and the body and drip moldings, and this is simply the woodwork. The body is composed of the frame and the panels (with the top when this is completely enclosed), the front, the rear gate or doors, the windows, ventilators, and so on, and each part must be created by the designer just as is any other work to exact measurement. Not only this, the dimensions of each tenon, each mortise, each lap, each splice, each socket, each radius is specified and each design for decoration is drawn. If metal is used the formation of the joints and the reinforcements must be drafted and provision made for these in the wood that is to be shaped and fitted about them, should this be necessary.

In this connection it may be noted that sheet metal has been used for many years for panels, particularly for service vehicles, and it has only been since the advent of the motor conveyance that aluminum has been utilized for panelling, it being susceptible of high finish and free from shrinkage or expansion from varying degrees of moisture. Sheet steel and sheet iron have been utilized wherever the wear has been excessive and there is today a disposition to use these materials to a greater extent than ever before.

With the preparation of the specifications it is necessary to designate every bolt, rivet, screw, or other fastening, and the number and proportion of each. In addition there is also description of all hardware of standard manufacture or of special type, and besides this each band, brace, bracket, rod, truss, clamp, clip, or other metal part that must be forged by the blacksmith is set forth in detail. Where it is necessary to build a bolster or under frame to install on the chassis to carry the body the components are similarly specified.

All Details Checked and Described.

The details when classified and systematically enumerated are checked through and then the main plan is drawn. Then the body is described and with this description is a series of working instructions relative to each particular assembly or group. These relate to the woodwork only.

Then in turn is a specification for the trimming department which relates to the upholstery, if this be made up in connection with the body work, and similarly a specification relative to the painting, with a sketch or sketches and whatever special design may be desired for the decoration of the body. Where carving or stamped metal is used the facts are similarly set forth.

The working drawings are made and frequently blue prints prepared and with these the specifications are sent to the foreman of the woodworking department. He usually selects the stock from the rough lumber and this is taken and shaped to the form desired. Selecting the stock is work for an expert, and when it has been picked out with reference to securing parts of the required quality with the least waste it is left with the wood workers. Meantime the specifications for the blacksmith shop have been sent to that department and finally when all parts have been made ready the workmen assemble the body, each part fitting perfectly.

The trimming is then begun and the work is made up in readiness for installation when the painting has sufficiently advanced, these two works being carried on together until the finishing is completed. Naturally there is an extreme range in these details according to the service for which the vehicle is intended. While it is possible to estimate with accuracy the stock that is required for the wood and metal work, as well as the trimming, the finishing is more or less variable and may be inexpensive or costly.

Small Body on Heavy Chassis.

Reference has been made to the necessity of the design-

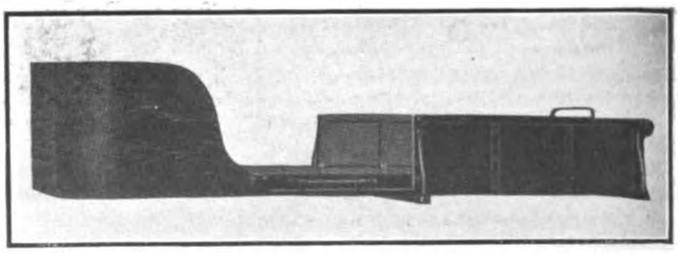


Fig. 2—Roman Front Truck Body with Side Panels and End Gate.

er considering the construction of the chassis on which the body is to be installed and that the character of the body ought to be with regard to the service, and to bear

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out this statement it may be noted that in one instance where a truck was to be used by a steel company for the transportation of metal the builder installed a platform of the size that would have ordinarily been used on a 6000-pound chassis on a chassis rated at 13,000 pounds. The reason for this was that with the larger construction the truck might have been overloaded, and in any event with that type of deck the load might have been carelessly put on. With the narrower and smaller platform there was less probability of such abuse. There was little reason to fear the unequal distribution of the load with relation to the length of the smaller body, although this might have been a frequent happening with the regular size. Besides, there is a tendency of the load to work backward in a wagon when it is not properly packed.

There is another factor in load distribution that is exceedingly potent—the wear of the tires. This is a matter of decided importance with the careful body designer. While he cannot materially change the weight distribution upon the shoes he can so create the body that with proper loading the load will bear on the tires approximately as intended by the designer of the chassis, which will afford the largest margin of safety for the components of the machine, a condition that decidedly influences upkeep and maintenance. Bodies that are intended for one service may be built to carry a certain load and always under definite conditions when it is maximum. For instance, most of the bodies for brewery wagons and trucks are intended to carry 21 barrels in three rows of seven, but when these have been partly unloaded it is desirable to shift about those remaining so that great weight is not carried on one side.

How a Designer Estimated Capacity.

As an illustration of the possibilities in this direction a manufacturer who was about to purchase a truck sent for a body builder and asked his advice as to the chassis he should buy, saying that he wanted the truck to do certain work between his works and a railroad terminal. He shipped his goods in varying cases and received shipments in others of differing sizes. The designer went to the works, measured all cases that might be similar to those making up loads, and on the basis of these and the chassis capacity he outlined a body in which the cases could be packed which approximated the designs of several chassis. With this information the manufacturer made his choice and the body was constructed at the designer's works. It is needless to say that it has been a very satisfactory installation.

It might be possible to make numerous illustrations of a similar character in which the value of the special body is worth much more than might be believed. This is especially true of the springs of the truck which are usually much abused when the load is excessive. The springs will eventually weaken under a normal load by continued use, and where there is overloading there is always hastening of the day when the springs must be replaced. Not only this, there is the possibility of breakage because all the force of impact with any road obstruction must be sustained by the springs besides carrying the load. With the breakage of springs a truck must of necessity be withdrawn from service and there is the additional cost of the replacement, two unnecessary causes of loss.

Excess Stresses from Overloading.

Another danger from overloading through the poor design is when the load is so placed that a considerable excess of weight is carried on one side. This will result in a much larger proportion of the load stress being sustained by a single rear wheel, and when not on a level and when turning corners, with the tractive effort and the turning strain, the wheel is subjected to forces that cannot be long withstood. With this condition to be met with in constant service there is the best of reason why the capacity of the truck should not be exceeded.

In the development of the truck body the statement has been made that it is possible that the body builder has created designs that may be, with reasonable modification, adapted to many uses, and having these designs it is possible for him to produce individual orders at prices that are in every way reasonable. That a single design may be made in differing sizes for varying loads, and from different materials, has been stated, and in connection with this it is well to point to some examples of possibilities in this direction.

Platform Truck Body and Modifications.

Probably the simplest form of truck body is that known as the platform, which requires the installation of a deck on a chassis on which many kinds of loads may be carried. It is possible by the use of stakes or side boards to convert this body to other uses, and being open it may be utilized for numerous purposes. The basis of practically all truck capacities is floor area, a tabulation of standard sizes being previously given in this article. Reverting to this, and regarding as a truck a vehicle with carrying capacity of 6000 pounds, it will be seen that there is a variance of but four inches in deck width and 28 inches in length. This gives 18.75 square feet additional carrying space, or about 26.04 per cent. more with the larger vehicle, while the capacity increase is 60 per cent. Taking a load of the same commodity it would be necessary to pile the load higher on the larger body, and no matter how this is done the centre of gravity is necessarily higher and there must be a greater strength of construction than would apparently be justified by mere increase of load.

Taking the platform body for transporting heavy material this affords every need, but stakes are usually provided for the purpose of securing the load. These may be of any convenient length. A typical type of this design is illustrated at Fig. 1, this being known as a Roman front platform from the curved front, which is assumed to resemble the Roman chariot. This platform will not have quite the area of the square, but the reduction is slight.

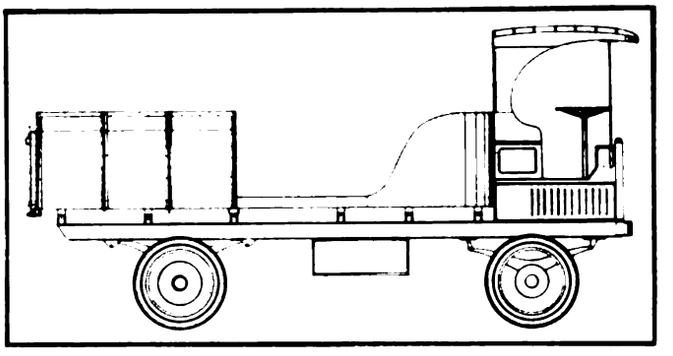


Fig. 3—Roman Front Steel Truck Body with Flare Boards on Sides and End Gate.

The front is of heavy sheet steel and serves to retain the load when packed. Stake sockets are bolted to the sills and with these a rope or chain can be made to form a light but effectual rail. The value of such a body is that it may be unloaded from either side or the rear and packages wider than the platform may be carried if the load should be bulky. This body is regularly built in 4000, 6000, 8000 and 10,000-pound sizes.

Taking this same design of platform body it is converted into a brewery wagon or truck by the installation of the sides as illustrated at Fig. 2, this being known as a Roman front body with side panels and end gate. This form is primarily designed to carry barrels at the forward section and kegs at the rear piled between the side panels. In this manner a full load may be well balanced by the pyramid form of the kegs, these being placed on the sides. The dash is extended back slightly and serves to retain the barrels, with abundant space for handling them, while rolls on the sides of the sills convenience loading and unloading. The side panels are secured to frames and well braced by extensions of cross members at the ends of the frames and by iron braces from the tops of the panels to the extensions. This body has the capacities stated for Fig. 1.

Still another illustration of the use of this type body is shown at Fig. 3, which is designated as a Roman front steel with side panels and end gate, with flare boards on the side panels. This body is intended for the same general use as is that at Fig. 2, but it is somewhat differently proportioned as to sides and front, these being higher and permitting a larger load. The platform frame of this body is of wood

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and on this is carried the steel body, a construction that is especially enduring and which ought to be serviceable for a long period. The body is differently constructed than are the others and it is, of course, more expensive, but it has a similarity in design that is apparent. This body is built to the same capacities as are the others.

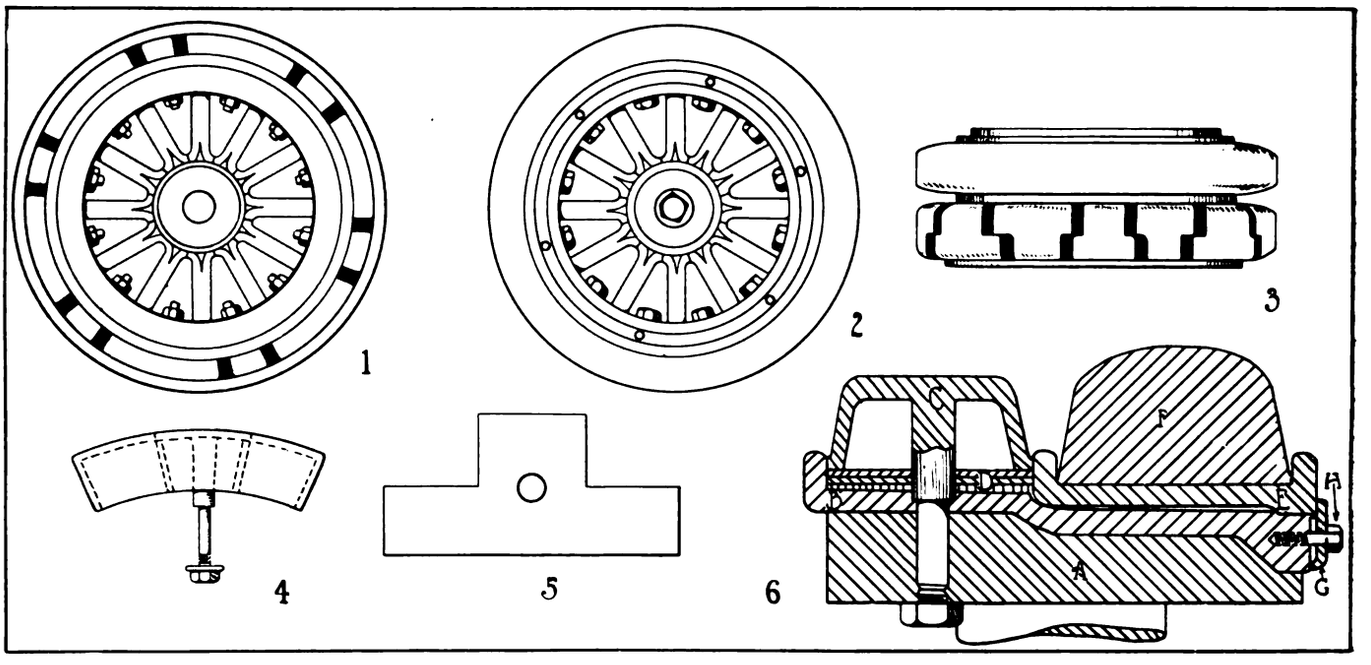
It is probable that no better examples of bodies might be pointed out for those who desire to give some attention to design and construction. Taking the plain platform, for instance, it is but slightly modified as compared with the deck having squared ends, and with the foundation of the deck it is possible to devise a very large number of bodies, each of which presents features differing generally, if not wholly, above the platform.

(To Be Continued.)

BALDWIN SECTIONAL STEEL TRUCK TIRE.

L. F. N. BALDWIN, Providence, R. I., who is noted as a racing driver, and is one of the best known motorists in America, has invented a sectional steel tire which he claims possesses qualities that particularly adapt it to heavy vehicle service and which, he maintains, can be adapted to any rim now in use. This tire is designed to be used in combination with solid shoes of the present types, Mr. Baldwin claiming for his invention that it will minimize the wear and greatly prolong the life of the rubber tire used with his device.

The tire is unique in that it may be adapted to conform to the reduction in size of the rubber shoe through wear and that the diameter of the wheel as a whole may be varied as desired. This is accomplished by using metal liners or shims between the block and the rim. By these the external diameter of the tire may be increased or lessened, a process that requires but little time.



The Baldwin Combination Steel Block and Rubber Tire for Service Wagons.

As may be known, rubber and rubber compositions cannot be compressed, but can be distorted. Under the pressure of loads and driving stress any solid tire will change its form and the tendency is for the material to be forced from the actual place of contact of the tire and the ground or paving on which it stands. As the tire wears the resiliency from the elasticity of the rubber compound is lessened because there is a reduction of material.

Because of the rear wheels carrying the greater part of the load as well as transmitting the power the tires wear more rapidly than the forward shoes, for which reason dual tires were adopted. Mr. Baldwin claims for his invention that the steel shoe carries the load and resists the wear, and the rubber shoe affords the traction necessary. He holds that on ordinary unpaved roads there is no need of carrying the load on rubber alone and that on paving traction is a condition more required than a cushioning effect or the reduction of noise. The steel tire is to be used with the surface slightly lower than the normal face of the rubber shoe so that under compression the rubber and steel surfaces will contact with the road surface. With the weight of the load largely carried by the steel tire he claims economy in that there is a reduction of the rubber surface a half, while the combination insures traction under all conditions of service.

The tire blocks may be made of any metal desired, but manganese steel is a probable material because it may be cast and it has unusually enduring qualities. As will be noted at Fig. 3 and Fig. 4 the blocks are formed so that when installed there is a space between the ends, which is to provide for the reduction of the external diameter of the tire. This space will vary from an inch to an inch and a half in width and it will afford traction on all unpaved roadways where the blocks contact with the ground. Reference to Fig. 6 shows a cross section of a block, which is cored to secure lightness. The blocks are secured to the rim and felloe by bolts cast integral with them. The blocks are so located that the bolts are about midway between each spoke. They are secured by nuts and lock washers or other device.

The method of installation is to fit a special rim to the wheel, the form of which is illustrated at Fig. 6, and this is shaped with a flange at the inside. Against this flange the shims are placed, and on these shims the block, the same bolt that retains the block retaining the shims. The channel section carrying the rubber tire is installed as is any solid wheel shoe, one flange of the channel holding the block rigid against the wheel rim flange. When a new installation is made the surface of the rubber tire is about an eighth inch above the steel blocks, or a quarter inch more in diameter. As the rubber is worn a shim may be removed from beneath each block, and the shims may be of any thickness that practise will dictate, so that the diameter of the steel tire is uniformly reduced until a point is reached where the rubber tire is no longer serviceable.

With the rims now the vogue the blocks may be installed by drilling the rim and felloe for the retaining bolts and the block may be retained against the rim flange of the

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rim by the channel of the rubber shoe. The wheel felloe and rim may be made any thickness and width that is desirable and the width of the steel tire whatever proportion is necessary to yield the best service. The rubber shoe is mounted on the outside of the rim to facilitate ease in installation or removal. It is not believed there will be occasion to remove the blocks unless for the reduction of diameter by the thickness of a shim as necessitated by the wear of the rubber shoe. The construction has the merit of cheapness and endurance and it is held by the inventor that the tires, when used wherever dual shoes are installed will yield equal results so far as riding qualities are concerned, will give far greater mileage for the rubber tires, thus lessening the expense from one point of view, while the metal castings, after the first equipment, will be useful for a considerable period—perhaps several years.

The descriptions of the detail drawing are: Fig. 1, side elevation of wheel, showing side of sectional blocks retained by bolts through the felloe. Fig. 2, reverse elevation of wheel, showing rubber shoe retained by flange and bolts or cap screws. Fig. 3, plan or top view of tire assembly, showing blocks and spaces. Fig. 4, side view of steel tire block, the dotted lines indicating the core. Fig. 5, plan view of steel shims. Fig. 6, cross section of tire assembly with these components: A, wooden wheel felloe; B, steel tire or wheel rim; C, cored steel block and retaining bolt; D, shims between steel block and wheel rim; E, demountable channel carrying rubber shoe; F, rubber tire; G, retaining flange or ring; H, retaining bolt or screw.

HOLD THREE-DAY CONVENTION.

The first annual convention of the agents of the Speedwell Motor Car Company, Dayton, O., was held recently in that city and the event occupied three days during which time the visitors were royally entertained by the company. During the daily sessions the visitors were addressed by the heads of the different departments and the subjects included advertising, accounting, service, engineering, care and operation. Harry Croninger, who is in charge of the commercial department of the company, and who has a wide experience in truck work, addressed the convention upon the co-operation between the factory, agent and owner, imparting much valuable information. Matters pertinent to the truck industry were discussed. Those present included agents from all sections of the country.

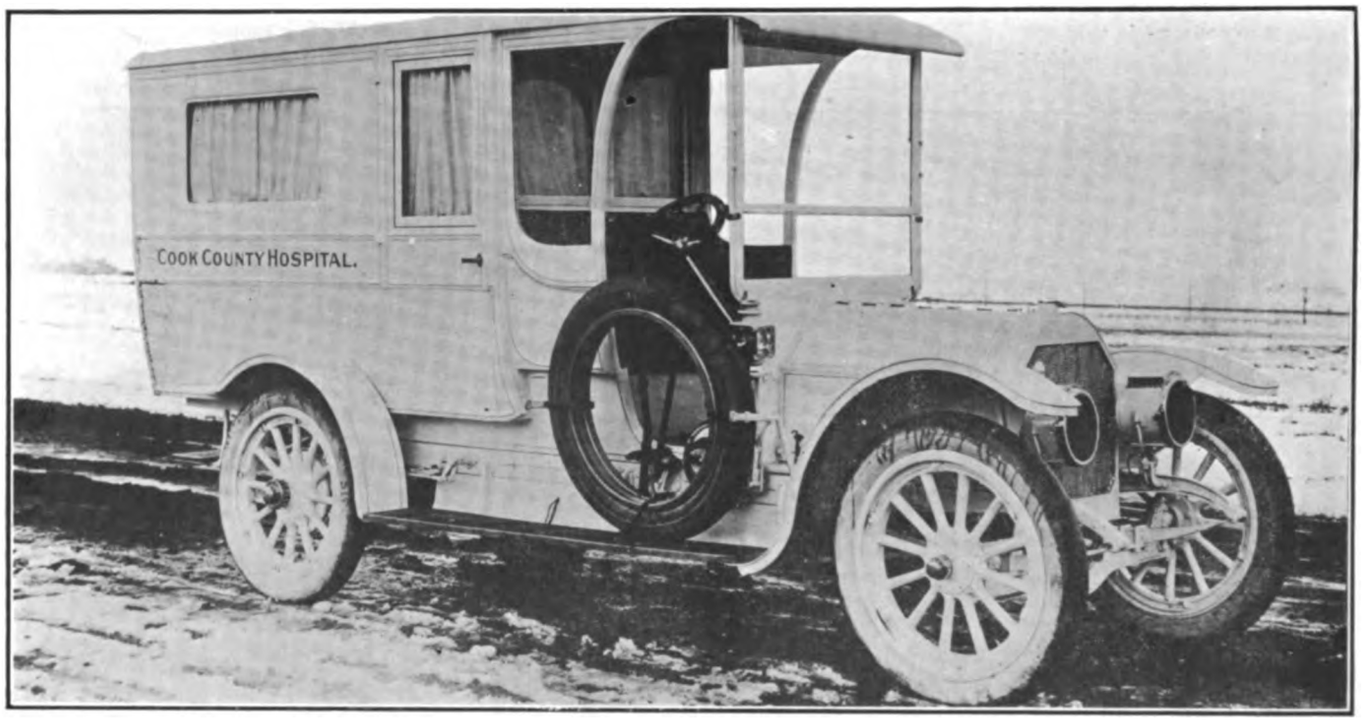
REPORTS GOOD TRADE PROSPECTS.

According to George L. Sullivan, Alco sales representative of the American Locomotive Company, New York City, who returned recently from a trip extending over a period of two months, the prospects are excellent for large sales in the spring. He states that all over the country visited by him heads of business concerns are investigating the possibilities of the commercial vehicle and many have decided to replace the horse drawn equipment with the motor car.

In one city of 92,000 persons, Mr. Sullivan reported that eight cars would be sold, five of these to be bought by one house, a big department store with branches covering considerable territory. These machines will be ordered before February. A meat packing concern in the same city is to place a car in operation to haul its product from a town 36 miles away, and expects to double its present facilities.

In another western city a moving and transfer concern which makes long distance hauls to nearby towns, will add automobiles to take care of this end of the business. Another concern is figuring on 10 cars to be fitted with special bodies to compete with street car lines.

A plan whereby five business houses, all of different types, could be utilized on a community basis, has been worked out by a truck dealer in one city, and it is proposed to purchase six machines and operate these jointly, thus effecting a considerable saving in the initial cost and maintenance.



Ambulance Body Designed and Fitted to 50 Horsepower Chassis By the Kissel Motor Car Company, Hartford, Wis., for Cook County Hospital.

REPEAT ON LAUTH-JUERGENS.

One of the best evidences that a motor vehicle is giving good service is held to be the fact that concerns give the maker repeat orders. This being true, it would seem that the Katz Mattress Company, Chicago, has been decidedly satisfied with its first Lauth-Juergens truck, made by the Lauth-Juergens Motor Car Company, Fremont, O. The latter concern recently received an order for two two-ton vehicles, it being the third repeat order sent in by the mattress company.

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KNOX TRUCKS REPLACE HORSES.

Worcester business men were afforded an opportunity to note the progress of the commercial vehicle recently when the Worcester Brewing Company, W. H. Blodgett Fruit & Produce Company, the W. N. Gleason Company and the American Mail Order Company, discarded the old time railroad delivery of goods which necessitated packing and hauling to the freight depots. In place of horse drawn equipment motor trucks have been installed and, whereas it formerly required two days to deliver goods to Leominster and Clinton, it now takes but two hours. A Knox three-ton truck, made by the Knox Automobile Company, Springfield, Mass., in service with one of these companies left Worcester one day at 11 in the morning and arrived at Clinton at 1:45 in the afternoon, unloaded at several places, and was back in Worcester ready for other deliveries a few hours later. Knox cars are utilized by all the firms mentioned.

ADDS FIVE COMMERS TO FLEET.

Last winter the firm of H. L. Herbert & Co., New York City, a large coal dealer. experimented with a 6.5-ton Commer truck, which was placed in service by Wyckoff, Church & Partridge, Inc. An earlier test of motor propelled vehicles by the concern is said to have been unsatisfactory, but the improvement in the automobile and success of other coal companies led it to try the Commer truck, and for 13 days during the cold weather this car was subjected to strenuous work.

During the time the cost of operation and work performed was noted and it was found that 572 tons were hauled at a cost of less than six cents a ton mile. This led the company to order a similar machine, which was placed in service in April. A trifle over four months later a second automobile was purchased, and with the contract was a letter which stated that the first vehicle had lived up fully to the record made in the demonstration.

In November a third car was secured and the company promulgated a plan to replace its horse drawn equipment with the motor propelled vehicle, giving an order for five more, making a total of eight in service. In the accompanying illustration is shown three of the cars fitted with special coal dumping bodies, the photograph being taken at the yards of H. L. Herbert & Co.

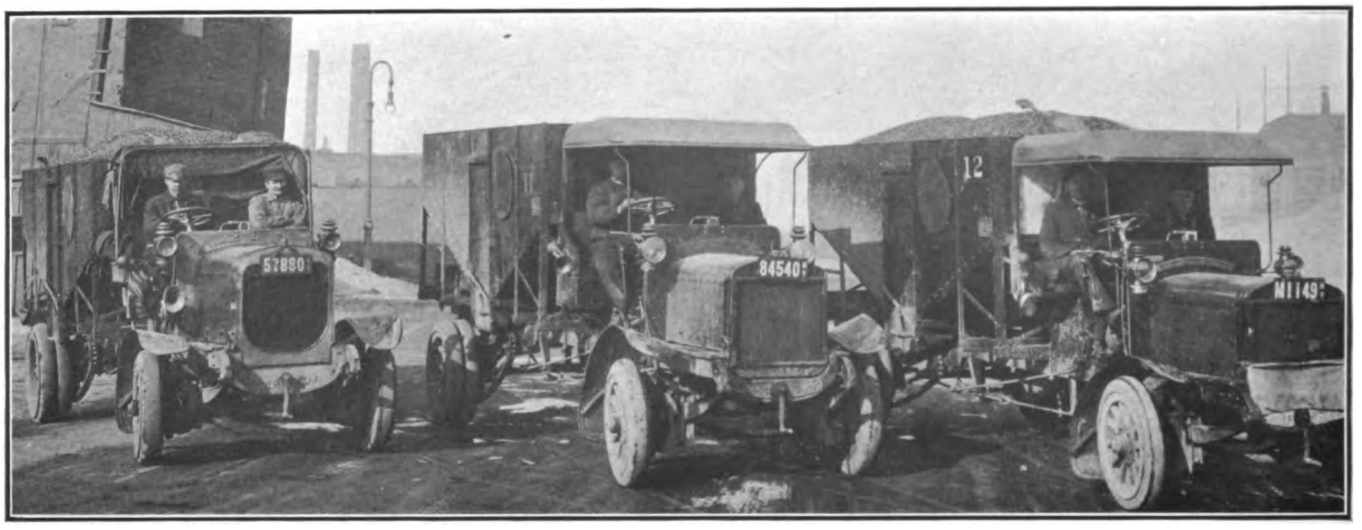
METZGER TO BUILD ONE-TON TRUCK.

The Metzger Motor Car Company, Detroit, announces that although it has resold to the Hewitt Motor Company of New York City, a large share of the truck business formerly conducted by the concern, it will continue to manufacture in Detroit, the one-ton model, which will be known hereafter as the Everitt, instead of the Hewitt, as formerly.

In speaking of the matter W. E. Metzger said recently: "We have by no means discontinued the manufacture of commercial vehicles. Lack of facilities in the past has prevented our giving much attention to this branch of the business, and rather than divide our energy, we decided to dispose of a portion to E. R. Hewitt's new company, retaining the right to built the one-ton size. We shall continue to make this car in Detroit without interfering with our pleasure automobile business, and its small size will enable us to manufacture in quantity. Operations have already begun and the new models will be marketed early in the spring. Their distribution will be effected by over 400 dealers handling the Everitt line."

SHIPPING GAS TANKS ABROAD.

According to the Prest-O-Lite Company, Indianapolis, Ind., when automobiles are exported it is necessary to certify on the steamship bill of lading that fuel, water and gas tanks are empty. Unless this is done the companies will refuse to accept the shipment even if the car be crated and boxed. The Indianapolis company suggests that to prevent the uncrating of the machines and emptying the tanks, an empty member be utilized and that a conspicuous label be employed to denote this condition. A list of the countries where tanks may be exchanged for full ones is published by the company and may be obtained upon application.



Recent Addition to the Fleet of Commer Trucks in Service with H. L. Herbert & Co., New York City—This Concern Bought Its First Truck in April and Now Maintains Eight Machines.

CONTEMPLATE MOTOR 'BUS LINE.

Business men in Fort Dodge, Ia., are contemplating the organization of a company to finance and operate a motor 'bus line in that place. The scheme calls for at least four machines and these will be operated on regular runs, reaching all parts of the city.

MAIS EXHIBIT AT NEW YORK CITY.

During the automobile shows in New York City recently the Mais Motor Truck Company, Indianapolis, Ind., exhibited two models in the National Boat salesroom, opposite Madison avenue entrance to Madison Square Garden. The display attracted considerable attention, being so located that patrons of the show could find it easily. President and General Manager Will H. Brown and C. H. Wallerich were in attendance and explained the features of the car with the internal gear drive.

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ELECTRIC VEHICLE BREVITIES

Robert McAllister Lloyd, vice president and general manager of the General Vehicle Company, Long Island City, N. Y., in discussing the transportation problem recently, brought out some pertinent facts regarding the standardization of the electric vehicle, a step which he advocates and one which he states would be a great benefit both to the manufacturer and purchaser.

"It has been fully demonstrated by the results obtained during the past 10 years that self-propelled road vehicles may be used economically and advantageously to displace the horse drawn equipment, also to compete with railroads in certain classes of transportation," says Mr. Lloyd. "But owing to the many systems utilized in the application of power and great variety of designs, the buyer and user of the electric vehicle is likely to suffer much inconvenience from the lack of uniformity of design unless steps are taken to standardize the working parts and some of the auxiliary apparatus.

"There is strong evidence that both the electric and gasoline machine will be used in large numbers and automobile engineers and makers are beginning to study the possibility of making interchangeable some of the features common to both types of cars. The principal item to suffer from use on all vehicles is the tire, and a consideration of this problem has resulted in the recent adoption by most manufacturers of standard wheel and tire dimensions, which make it possible to interchange various makes of tires on any standard rim. There are many other items common to both the gasoline and electric which are being standardized but these are mostly minor details.

"A standard voltage should be agreed on and battery compartments of standard dimensions should be adopted. This would enable the operator of a vehicle to borrow or rent a battery in an emergency and would permit the owner to take advantage of improvements in batteries coming on the market from time to time. At present there is no standard as to the number of cells constituting a battery and therefore the charging equipment needed for one wagon may be different from that required by another. The voltage of electricity throughout the country is so nearly uniform that it would not be difficult to agree on a standard battery voltage and so make possible the standardization of charging switchboards with their instruments, rheostats, etc., as well as the instruments utilized on the vehicles.

"The majority of electric commercial vehicles use a 44-cell battery having on discharge about 88 volts. The motors on these cars are rated at 85 volts and 90-volt lamps are employed, and the charging switchboard is designed accordingly. Some machines are equipped with 24-cell batteries and other combinations. Confusion and sometimes damage result from attempts to charge these lower voltage batteries in garages where wagons with higher voltages are maintained, and there are many serious disadvantages in grouping vehicles of various voltages in the same garage. Low voltage lamps are burned out when they happen to get into high voltage wagons and low voltage members are spoiled in charging from high voltage switchboards.

"The number of cells required for a given voltage of Edison battery differs from that needed for the common lead type, and the voltage of the motor and lamps used would be different. It is possible, however, to fix upon a standard number of Edison and lead type cells which could be charged from the same switchboard. If all electric vehicles were equipped with either 44 cells of lead battery or 60 cells of Edison, it would enable the manufacturer of motors, etc., to produce these articles to greater advantage and give better satisfaction to the users.

"Thus far the makers have not been very successful in getting together on the question of standard battery voltage, but this should be accomplished. It would be unfortunate if action were delayed, as in time the amount of obsolete material thrown on the scrap heap will be far greater than it is today.

"If standard voltage should be adopted for all electric vehicles not only would batteries be interchangeable to a great extent, but also motors and possibly controllers. The fact that an owner could exchange motors with his neighbor or re-equip an old car with an up-to-date power plant, or with one part of it at a time, would place the electric in a unique position as compared with other automobiles. It would be a short sighted policy for any manufacturer to take the stand that he preferred to construct his machine so that a motor, controller or battery made by another firm could not be applied to it.

"It is recognized that the electric vehicle is more fool proof and easier and more economical to operate within its radius of action than a gasoline car, and it would be folly not to take advantage of the opportunity to make its most important features interchangeable, as this would add greatly to its popularity and hasten the time when the horse shall be permanently retired to agricultural pursuits."

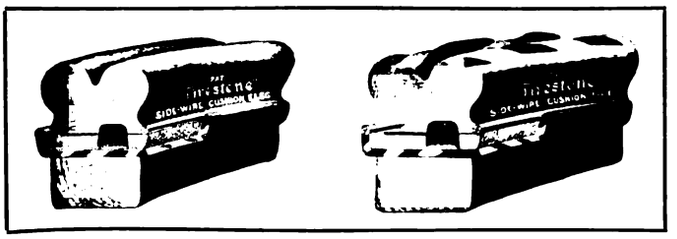


Anderson Electric in Service with Grocery Firm at Winnipeg, Manitoba, Having Given Excellent Satisfaction Under Severe Climatic Conditions.

A newcomer in the ranks of commercial electrics is the Argo Electric Vehicle Company, Saginaw, Mich., which concern makes two models of 1000 and 2000 pounds ca-

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pacity, respectively. These vehicles utilize a shaft drive with a herringbone gear for the final reduction, which method is said to result in high efficiency, silence and com-



The New Firestone Cushion Tire for Electrics: At Left, Depicting the Smooth Tread Type; at Right, the Anti-Skid.

pactness. The smaller vehicle is known as Type 10, has a wheelbase of 86 inches with tread of 54 inches, and is fitted with solid tires, 34 by three inches. The battery equipment is 28 cells, 11 plates M. V., Exide being standard, but Ironclad or Edison are furnished as extra. The body provides a loading space 90 by 42 inches.

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The Firestone electric tire, made by the Firestone Tire & Rubber Company, Akron, O., with which electric vehicle users are familiar, has been improved in many ways, particularly in its easy riding qualities. This has been brought about by fitting the tire with a double or dual tread and by the addition of internal cavities at frequent intervals in the base, directly under the tread whereby the full cushioning effect may be secured. The dual tread was introduced for motor truck tires by the company about five years ago and was generally adopted. It not only provides a cushioning effect but serves to prevent skidding. By placing the cavities wholly within the tire an exceedingly neat and attractive appearance is secured. To obviate creeping and to ensure a firm fastening on the wheel the side wire method of attachment is utilized, and this form is in general use on heavy commercial vehicles. The tire which is manufactured in smooth and anti-skid tread, as depicted herewith, is known as the Firestone side wire cushion electric, and although it has been on the market some time it has not been widely advertised until recently.

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The practicability of the electric commercial vehicle is demonstrated by a 1000-pound capacity machine in service with the A. Macdonald Company, wholesale grocer, of Winnipeg, Manitoba. The vehicle, which is made by the Anderson Electric Car Company, Detroit, Mich., is fitted with a battery comprising 60 A-6 Edison cells, and during the six months it has been operated it has averaged from 40 to 50 miles a day, during part of which time the temperature has been as low as 20 degrees below zero. In the accompanying illustration is presented the car carrying one of its usual loads, and in writing of the automobile the owner states it has given excellent satisfaction.

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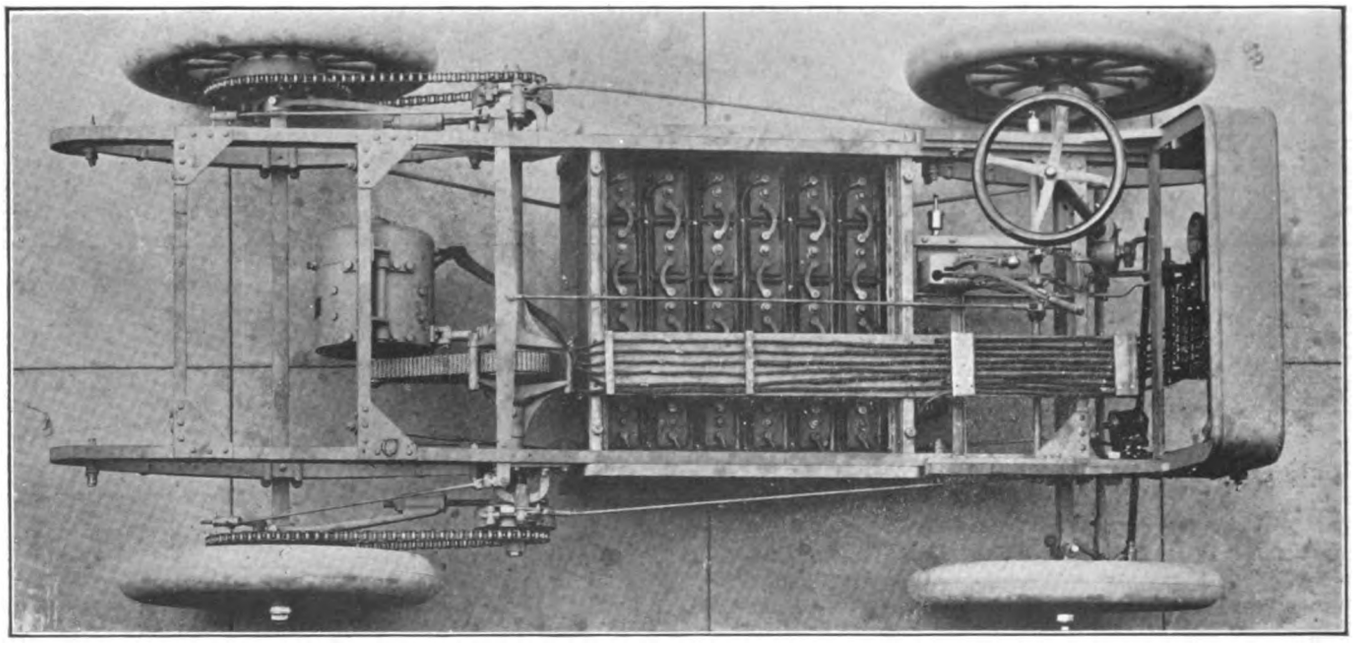
The growing demand for power wagons for light delivery work has stimulated the development of electric vehicles to such an extent that they are fast replacing the horse drawn equipment. Many department stores have adopted the electric after experimenting with various types of mechanically propelled vehicles, and in several cities large fleets are maintained.

The Kentucky Wagon Manufacturing Company, Louisville, Ky., successor to the Electric Vehicle Company of that place, has brought out two new models of 600 and 1000 pounds capacity, respectively, and in the accompanying illustration is depicted a chassis of the former type. These are fitted with different body designs to meet the requirements of the purchaser. Without departure from thoroughly conservative practise, the maker has incorporated a number of refinements which make for long life, low cost of upkeep, high mileage, accessibility of parts and convenience to the operator.

The motor is a General Electric, 60 volts, and is suspended from the main frame just forward of the rear axle. Power is transmitted to the countershaft by a silent chain enclosed in a dust proof steel case. Final drive is by roller side chains, a system that makes for simplicity, efficiency and accessibility. The countershaft is of the enclosed type and is carried upon ball and roller bearings. The motor shaft is mounted on Hess-Bright annular ball bearings. Bower roller bearings of ample dimensions are utilized in the rear wheels.

The battery is mounted on a sub-frame immediately in front of the countershaft. The 600-pound capacity model is equipped with 30 cells of the lead plate type while the larger vehicle is fitted with 50 Edison A-4 cells. This equipment is stated to give a mileage of from 40 to 50 under normal service conditions. When a higher mileage is desired a larger battery equipment will be provided. It has been the experience of the company, however, that the standard battery is sufficient to meet all usual requirements.

The controller is of the continuous torque type, affording three speeds forward and two reverse. Its location is a departure from ordinary practise, as will be noted in the illustration herewith, being bolted to the dash and protected



Chassis of 600-Pound Capacity Electric Delivery Wagon Brought Out by the Kentucky Wagon Manufacturing Company Which Is Noticeable for the Number of Refinements and Accessibility of Mechanism.

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by a short hood, and this part of the system with its wiring is easily accessible by the removal of the light dash panel which is held in place by four thumb nuts. This hood serves to protect the headlights, meter and switches, and the vehicle body is free from wiring. This is a desirable feature, inasmuch as the body may be removed after six bolts which hold it to the frame have been taken out.

The brakes are two in number and have liberal friction surfaces, the service member being of the contracting type operating on drums riveted to the countershaft sprockets and actuated by a pedal through a flexible equalizer. The emergency member is of the expanding type operating on the rear wheels by a latched lever through an evener which extends through the frame just above the countershaft. Both brakes are eight inches in diameter and of two-inch face.

The frame is of channel section pressed steel, with three well gusseted cross members of the same section. Truss rods running from the forward cross member beneath the sub-frame and up to one of the rear cross members, prevent the frame from sagging, and permit of a light frame section.

The front and rear axles are of the I beam section type and the forgings are weldless, from end to end. The steering knuckles are of the reversed Elliott type. The springs are long, semi-elliptic, both front and rear. The wheels are of selected hickory, artillery type and are fitted with solid tires, 34 by 2.5 inches, though pneumatics are furnished at an extra cost. The wheelbase is 86 inches and the tread standard, 56 inches. A Sangamore ampere-hour meter is utilized and this is mounted on the dash.

Steering is accomplished through a semi-reversible worm and gear mechanism, and this is fitted with hardened gears and ball thrust bearings. The steering column is raked at an angle of 25 degrees from the vertical and the usual wheel is provided.

Believing that the question of control had not received the deserved attention from designers, the company has considered this subject carefully and located the driver at the left, placing the control and emergency brake levers at the right in the centre of the car. The control lever is operated in a gate, being moved forward for the four forward speeds, and back for the two reverse. Before passing from neutral to reverse a latch must be raised and the side lever given a side movement, thus providing against accidental reversal.

The emergency brake lever is operated by being moved to the rear. When the machine is at rest it will be noted that both levers occupy such a position as to insure easy entrance and egress of the operator from either side of the car.

In addition to the control lever, an emergency lock switch is provided which opens the circuit when a plunger is pulled out. The latter locks in open position and may be returned by the use of a Yale key. This arrangement prevents use of the machine by others than the driver or authorized person.

Liberal provision is made for lubrication of all parts subject to the slightest wear. Brake and control set shafts are made hollow and provided with one large grease cup each by means of which lubricant is forced to all necessary points. The spring eyes are fitted with grease cups made integral with the hardened and ground shackle bolts. Oil and grease cups are provided on all steering connections and knuckle pins, and countershaft bearings are similarly equipped.

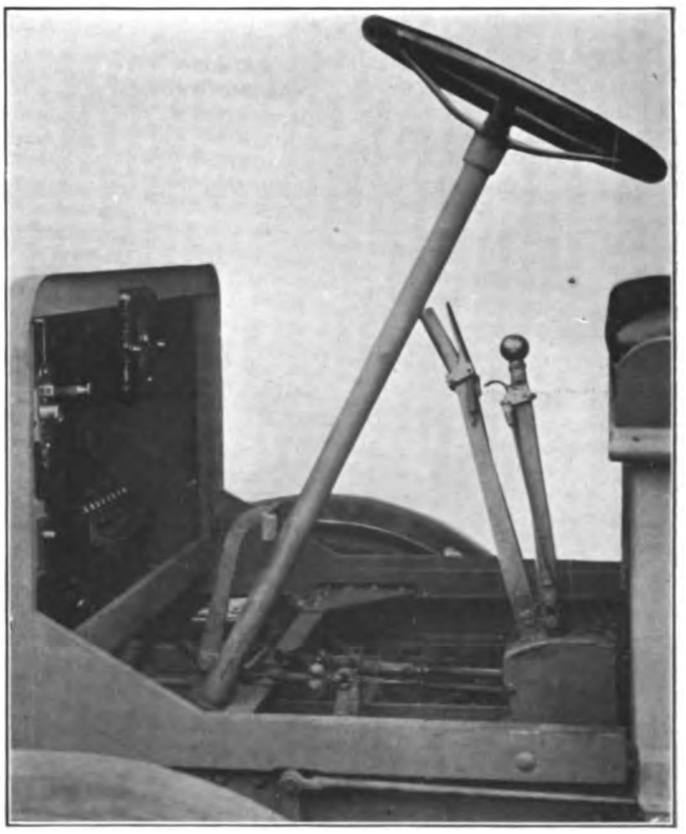
Two protected flush type electric headlights are mounted on the dash and the tail light is also operated by electricity. The standard type of body fitted to the 600-pound vehicles is panelled, and affords a clear loading space 60 inches long, 42 wide and 60 high. A similar body is provided with the larger car, this providing a space 73 inches long, 42 wide and 63 high. Other types of bodies are optional.

Electric vehicle manufacturers are anticipating with enthusiasm the 1912 Boston electric show, which will occupy the entire Mechanics' building in that city from Sept. 28 to Oct. 26, inclusive. The event will include displays of every known application of electric energy.

About 15,000 square feet of floor space has been set aside for the electric vehicle section, and nearly two-thirds has been engaged by manufacturers. All of the modern cars will be displayed, both pleasure and commercial, as well as the latest appliances utilized in connection with the machines and designed to bring about high efficiency.

Visitors and prospective buyers will have every opportunity to see the machines demonstrated as well as every facility for consulting statistics and learning from others how well the electric automobile does its work. In addition to the cars, an electric vehicle garage will be maintained in the building, and although a sample, it will be a model for practical adoption. The costs of various items usually included in garage charges will be based on efficiency in the operation of the garage, and an effort made to demonstrate how one is run where highest efficiency of service for customers with average profit for the management is secured.

Machines for demonstration purposes may be cared for at this garage, and it is expected that the various large users of electric vehicles for commercial purposes will keep cars there during the month. That the show will be a decided success as well as accomplishing much in interesting the public in the electric automobile, is conceded by those familiar with the subject, and this will be due in a large measure to the efforts of the Edison Electric Illuminating Company of Boston, which has been active for some time in promulgating information concerning the electric vehicle.



Depicting the Location of the Controller and Accessibility of Parts on Kentucky Wagon.

Day Baker, New England manager of the General Vehicle Company, Long Island City, N. Y., gave a stereopticon illustrated lecture before the New England Foundrymen's Association at Boston recently. He showed a large number of pictures presenting the progress of the electric vehicle from 1886 to the present. Of particular interest were the illustrations of baggage and factory trucks, six of which have been installed in the North station at Boston. The devices for factory work are operated at a moderate speed and are capable of carrying a very heavy load. A form of carrier utilized by large beef dealers also was explained and illustrated.

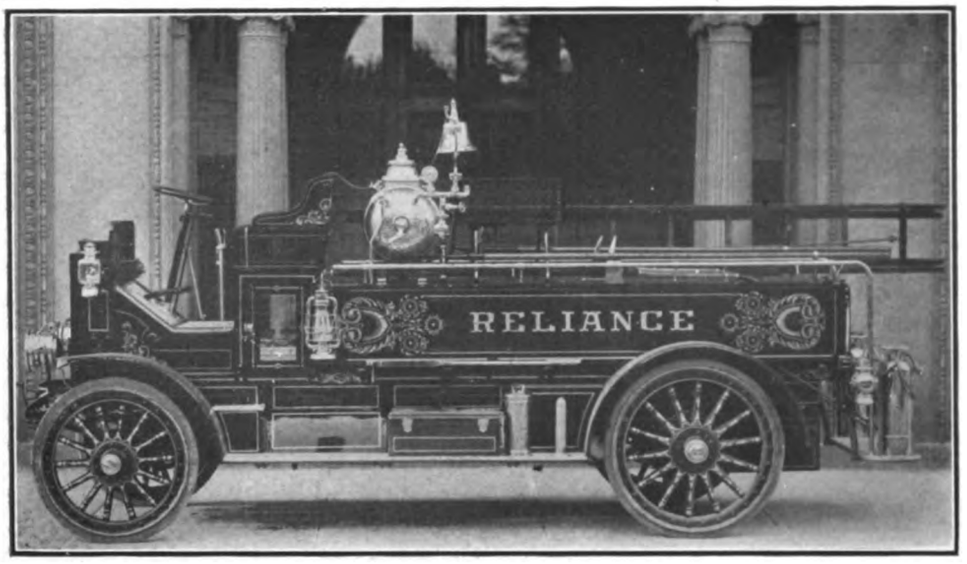
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FIRE DEPARTMENT NOTES

The practicability of the motor propelled fire apparatus was demonstrated to the citizens of Pittsfield, Mass., recently when with a gale blowing, fire broke out in a dangerous locality. The automobile made a record run, averaging over 40 miles an hour and reached the scene of the blaze so quickly that the flames were extinguished before they could communicate with the large number of oil barrels stored in the building. Chief Shepard of the department stated that the machine more than paid for itself at this fire alone.

The municipal authorities of Lynn, Mass., which is considering the purchase of motor fire apparatus, were given a demonstration of a 50 horsepower vehicle made by the Mais Motor Truck Company, Indianapolis, Ind. The chassis is specially designed for this work, is fitted with the Mais internal gear drive and is guaranteed to travel at a speed of 30 miles an hour for fire department work.

The trials were on Cedar, Greenwood, Mansfield and Hudson street hills, John C. Welsh, the Lynn representative of the company conducting the tests. All of the hills were climbed easily and the city authorities were very much pleased with the demonstration. It is proposed to fit the bodies of the present horse equipment to a motor car chassis.



Combination Hose and Chemical Wagon Made by Martin Carriage Works, York, Penn.

The Martin Carriage Works, York, Penn., maker of commercial vehicles, is manufacturing automobile fire apparatus and in the accompanying illustration is depicted a combination hose and chemical wagon produced by that company. The vehicle carries a large chemical tank and hose and the usual equipment in the shape of ladders, axes and other fire fighting appliances. The body accommodates several men, being roomy and well designed for the purposes for which it is intended.

The vehicle is propelled by a four-cylinder, four-cycle, water-cooled motor, with a 4.5-inch bore and five-inch stroke, rated at 36 horsepower, and its location is under the seat. Ignition is furnished by a magneto with battery in reserve. A multiple disc clutch is employed and a selective sliding gear affords three speeds forward and reverse with direct drive on third. Final drive is by side chains and two sets of brakes are utilized, on jackshaft and rear wheels. The front springs are semi-elliptic and rear half-platform. Solid tires are employed and the wheelbase is from 132 to 140 inches.

Throughout the country there is a growing tendency to replace the horse drawn fire equipment with motor propelled apparatus, and this movement is not confined alone to the large cities as the small towns, also are adopting the automobile. Many cities have expended large sums for modern horse drawn apparatus such as engines, etc., and these only lack the proper means of transportation to give efficient service. To discard this means a considerable loss as well as outlay of money to install the more modern equipment.

To devise a mechanically propelled vehicle adaptable to the horse drawn type, Charles H. Martin experimented with many designs and after much labor produced the Martin three-wheel tractor, a form of automobile constructed to haul the horse type of vehicles. The invention was taken up by the Knox Automobile Company, Springfield, Mass., well known maker of automobile fire apparatus, and subjected to a series of severe tests all of which the tractor withstood successfully.

The device consists of a steel frame, carrying a motor and transmission machinery, which is placed in front of the fire engine or any other apparatus designed to be horse drawn. In the accompanying illustration the tractor is geared to the front wheels and axle of a steam fire engine, and it will be noted that it is supported in front by a single wheel, which is utilized for steering and which permits of a five-wheel combination to be turned in a narrow street.

This wheel is suspended upon liberal springs which reduce vibration to a minimum and the engine and working parts of the design are protected thereby from road shocks. Drive is by side chains to the traction wheels of the fire engine and suitable springs are fitted, these being said to be fuly as resilient as those of the pleasure car. It is claimed that the members which support the tractor on the axle act as a cushion and that a considerable advantage is gained in starting a heavy load from a standstill. A sliding gear transmission facilitates this operation.

The tractor was exhibited at the recent New York show by the Knox Automobile Company, and attracted considerable attention from those interested in fire protection as every city in the country has horse drawn apparatus of proven worth that does not lend itself to ordinary automobile construction. In testing out the device it was driven over curbs, through plowed fields and sand banks, and did work successfully that an ordinary commercial car would not be called upon to do.

Chief A. V. Bennett of Birmingham, Ala., which city is equipped with several pieces of motor propelled fire apparatus, has been presented with another check for good work performed by his motor car department at fires. During October the automobile apparatus responded to 105 alarms, ran 1930 blocks, laid 15,250 feet of hose and used 366 gallons of chemicals.

Westfield, N. J., has placed in service its new Webb motor fire engine made by the Webb Motor Fire Apparatus Company, St. Louis, Mo. It is guaranteed to deliver 700 gallons of water a minute, taking suction from a plug of 45 pounds pressure and discharging through two 50-foot siamesed into one line, playing into one two-inch tip, or 650 gallons, taking suction from an open body of water with not over a nine-foot lift and discharging through two

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50-foot lines siamesed into one line playing into one two-inch tip. The car has a speed of 35 miles an hour and is equipped with Firestone tires, made by the Firestone Tire & Rubber Company, Akron, O.

The citizens of Auburn, R. I., endeavored to bring about the purchase of a piece of automobile apparatus last fall but the city council refused to take action. A fire broke out recently in a part of the town some distance from the station, and by the time the horse drawn apparatus reached the scene the flames had gained such headway they could not be checked and the property was destroyed. In commenting upon the blaze a local paper stated that had the department been equipped with a piece of automobile apparatus the house would have been saved, and that residents of that section are entitled to proper fire protection. It is proposed to have automobile apparatus even if the residents have to raise the money by subscription.

Mansfield, Mass., is well pleased with its installation of motor propelled fire apparatus which has been in service over a year. The cost of maintenance has been $30 and expense of operating $80, a total of $110. During the year the machine responded to 50 alarms, covering both inside and outside the fire districts and 35 of these fires have been taken care of by the squad manning the motor car. Chief King says in his report:

"Experience has fully demonstrated the fact that motor fire apparatus is the most economical, practical and efficient equipment and I hope it will not be long before appliances will be perfected so that all our apparatus may be equipped with motors." In addition he states that the flying squad has lessened by over one-half the work of the other members of the department.

Pontiac, Mich., has installed its first piece of automobile fire apparatus, the chief of the department estimating that it will take the place of three horses and that it will be used to cover the entire city. It is a combination hose and chemical wagon, made by the American-La France Fire Engine Company of Elmira, N. Y., and has been geared down to a maximum speed of 40 miles an hour. The capacity of the chemical tank is but 40 gallons, but the chief holds that if a blaze cannot be extinguished with its contents it is time to turn on the water. It is probable that other motor fire apparatus will be installed later.

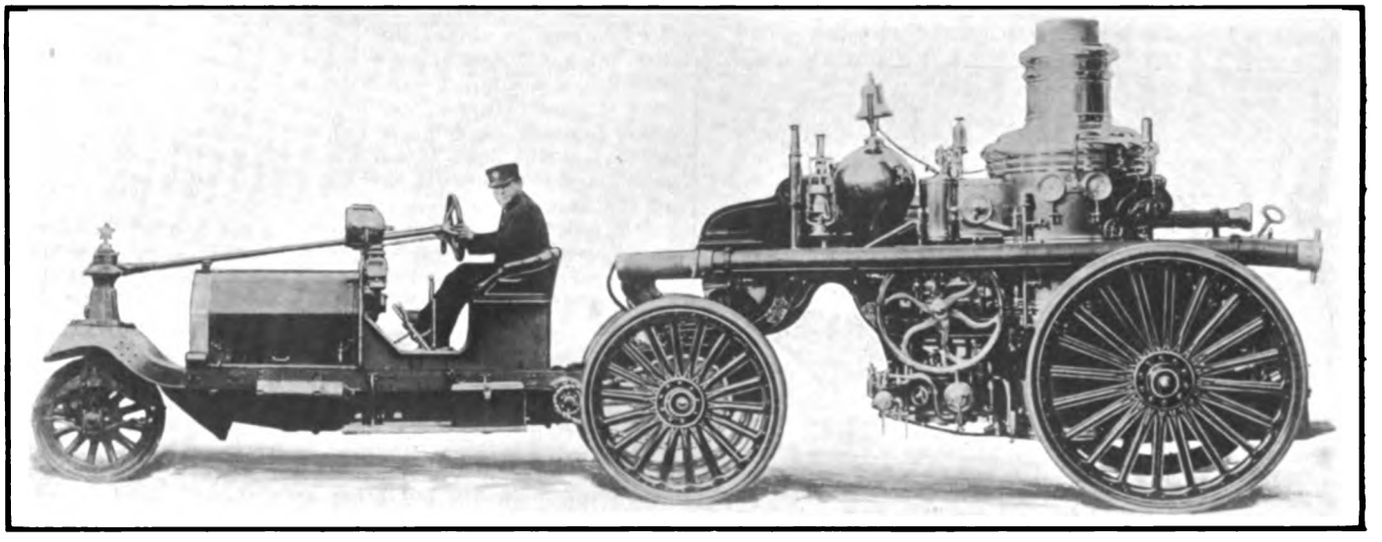
The following cities and towns have made appropriations for the purchase of motor propelled fire apparatus or are considering the same: Lynn, Mass.; Riverside, Cal.; Augusta, Ga.; Akron, O.; Paducah, Ky.; Pueblo, Col.; Hillsboro, Cal.; Binghamton, N. Y.; Dallas, Tex.; Nashville, Tenn.; New Britain, Conn.; Jacksonville, Fla.; Bridgeport, Conn.; Haverhill, Mass.; Rochester, Minn.; East Islip, N. Y.; Davenport, Ia.; Ottawa, Kan.

The White Company, Cleveland, O., maker of pleasure and commercial vehicles, recently shipped two pieces of motor propelled fire apparatus to its New York office. One of the machines is a chemical engine designed for the Young America Hose Company in Poughkeepsie, and the other is for the department in Mount Vernon, N. Y. The bodies were made in Kanawha, W. Va.

Two new fire companies have been placed in commission at Washington, D. C., and one of these owns the city's first piece of automobile fire apparatus which is a combination engine and hose wagon. The different companies of the city will be instructed in the use of the machine, as it is the plan of the chief to eliminate the horse drawn equipment.

Indianapolis, Ind., which is installing several pieces of motor propelled apparatus, had a bad year in the matter of fires. With less than a month remaining of 1911 the record of fires exceeded that of the previous year by more than 100.

Leominster, Mass., will place in service shortly a motor propelled combination hose and chemical wagon, the money to purchase which was raised at a special meeting last summer. It is probable that a special driver will have to be secured as the firemen driving the horse drawn vehicle do not care to operate an automobile.



The Martin Tractor Attached to a Former Horse Drawn Steam Fire Engine, Depicting One of the Many Uses to Which the Product of the Knox Automobile Company May Be Applied.

At a recent meeting of the city council in Princeton, Ind., a member of the council moved for the discharge of a special committee appointed five months ago to buy horse drawn equipment and suggested that another committee be empowered to investigate the advisability of securing motor propelled apparatus. The motion was carried and the mayor will serve upon the committee.

William R. Tucker, secretary of the committee on municipal affairs of the Philadelphia Board of Trade, in a recent communication to Herman Loeb, director of supplies, requested the city to provide new fire apparatus for the department and modernize the service. The former director, before retirement, planned to add eight pieces of the horse drawn type, but upon the request of the Board of Trade delayed action. In his lettter, Mr. Taylor called attention to the numerous cities within a radius of 100 miles of Philadelphia that have installed automobile apparatus

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MECHANICAL NOTES AND TIPS FOR DRIVERS



REMOVING TIRES FROM RUSTED RIMS.

Pneumatic tires which have been in service for considerable time and which have not been removed since being fitted, frequently give the operator trouble when an inner tube is replaced or a new member put on. This is especially true if the car be operated in all kinds of weather. Moisture finds its way between the shoe and the rim and a condition arises known as freezing of the tire. To remove one of these tires is a difficult task and the ordinary tire tools fail to start the member. If the shoe be in good condition one dislikes to try methods which would be likely to injure the casing.

An instance of a frozen shoe which resisted the efforts of the garage attendants was noted by the writer recently. The tire had been in service over 3000 miles during which time it had not been punctured or removed. About every scheme known to the workmen was tried but without avail.

An owner of a pleasure vehicle quickly solved the problem with a Fisk tire tool that is utilized with the bolted-on

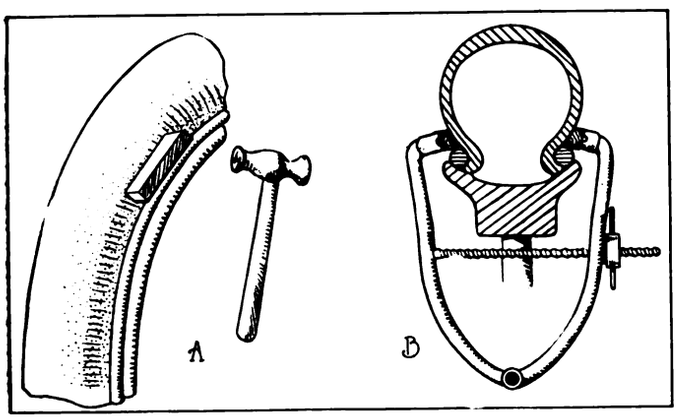


Fig. 1—Some Pneumatic Tire Removing Hints: A, Using Block and Hammer; B, Clamp for Starting Shoe Frozen to Rim.

type of casing and which is depicted at Fig. 1 B. It was clamped to the tire with blocks of wood interposed, as shown in the sketch, and when the device was operated the bead was started. A larger block of wood and a hammer were utilized as shown at A and the refractory shoe soon yielded to the treatment.

It was found that the rim was rusty and the operator decided to remove the other tires, after which the rims were sand papered and treated with a coat of graphite and oil.

IGNITION TIMING.

Although the general practise is to equip the commercial vehicle with a magneto for ignition purposes there are many cars being utilized which are fitted with timers or commutators, coil and either dry cells or storage batteries as a means of current. Others employ both systems, providing the timer or distributor for starting purposes and relying upon the mechanical generator for operating the motor.

With the former type there is more or less wear and parts subject to friction must be replaced, this depending upon the construction of the device and care given it. Frequently the operator who attends to the minor repairs of the automobile will remove the timer without considering its proper replacement, and unless he is familiar with the principles of ignition timing he will be obliged to call upon the expert repairman.

A knowledge of both valve and ignition timing will be valuable to the operator as not only will it be of assistance when overhauling the power plant, but in the event of trouble upon the road it will enable him to make the necessary adjustments and complete his trip.

By ignition timing is meant the firing and expansion, or explosion of the charge of compressed gas in the combustion chamber, not the time of the spark. There is a difference between the time at which the electricity jumps across the gap and that at which the charge begins. There is also an interval between the time of breaking contact at the timer and the ignition of the gas. This is termed a lag and to offset this the commutator is moved to bring about an earlier break, which is accomplished by means of rods connecting with a lever on the steering wheel. This is known to operators as advancing the spark. This advance may apply well where a magneto furnishes the current.

In order to obtain the greatest efficiency of the motor the volume of gas should begin to expand as the piston starts to descend; theoretically at the top of the compression stroke. Where a battery, timer and coil are utilized, there is a certain delay in the electricity reaching the plug as the current flows through first the primary and then the secondary paths before the spark takes place at the points of the plug.

This interval varies according to the number of revolutions of the crankshaft. Thus, when the motor is running at high speeds the spark lever is further advanced than at low. This setting ahead differs according to the design of the motor, also the amount of compression, density of gas charge and condition of battery, coil, etc., will have to be considered.

For example: With an engine running at 1000 revolutions a minute the spark should take place when the piston has about .625 inch to travel before completing the compression stroke. These conditions, however, do not exist when the engine is operating at a slower speed or when starting.

There are several methods of timing but the easiest for the amateur is by the piston. As cylinder No. 1 is usually nearest the radiator it can be utilized. If the former be fitted with a priming or compression cock, it is an easy matter to locate the exact position of the piston. A bicycle spoke or a piece of drill rod is inserted through the petcock as the cylinder is compressing. The latter may be located easily by opening all of the petcocks with the exception of the first member, and by turning over the motor, when the resistance will be noted.

The petcock of this cylinder is then opened and the rod inserted, and by a further movement of the starting crank the rod will begin to rise until it stops. This denotes the top of the compression stroke. The rod should then be nicked to indicate this position, and allowed to drop .5 inch; that is, the piston is permitted to descend this distance.

While this is a fairly good retard, it is safe for starting purposes and can be offset by the advance of the timer under the usual methods. Having located the position of the piston, the spark lever on the steering wheel is set back or forward, as the case may be, as far as it will go. Having fully retarded the lever the timer is adjusted so that the contact roller just touches the metal block which in turn is connected to the primary wire of cylinder No. 1, as shown in Fig. 2 A. The commutator is then locked by set screw or nut. In multiple cylinders it is only necessary to time

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one as the others should be correct. They can be checked, however, if so desired.

When the motor is not fitted with compression cocks or openings permitting the use of the rod, the centres of the flywheel may be utilized. In a four-cylinder motor two pistons are up and a like number are down when on dead centres. With the explosions occurring 1, 2, 4, 3, as shown in the drawing, the piston in the first cylinder has reached the top of compression stroke and travelled downward about .5 inch, as previously explained. One centre of the flywheel has passed by the indicator as illustrated in the sketch which depicts a crankshaft revolving clockwise.

Assuming the centre mark is correct, and not being able to check the piston lead by the usual method, it will be necessary to figure it out by using the diameter and circumference of the flywheel and stroke of the piston, in order to mark off the distance on the periphery of the former. Thus, if the diameter be 15 inches the circumference would be 47.124.

As half a revolution is made to a stroke, or 180 degrees, one-half of the above figure would be 23.562, which is in turn divided by the length of travel of the piston, 4.5 inches, giving approximately 5.23 inches to be measured off on the flywheel, as indicated in the drawing. This will about equal the .5-inch down-stroke, as previously explained.

It will be well to add another .5 inch or more, unless it be accurately figured. Longer or shorter piston travel and different sized wheels may be computed on the same basis, but while this method may be utilized when the timer becomes loose while on the road, it is not recommended. Should the timer be set too early a backfire will ensue and the operator might be injured in cranking.

Where the flywheel is not marked and the rod cannot be employed, it will be necessary to remove the lower half of the crankcase or an inspection plate to determine the centres. The piston of cylinder No. 1 should be brought tc the top of the compression stroke and the rim of the flywheel under the indicator nicked or marked. A half-turn will bring the piston of the second cylinder at dead centre when the wheel should be marked. This will give the centres desired.

Having obtained these it will be an easy matter to check off the point of contact on the timer and to note it on the flywheel. All four may be treated similarly. This will also aid in timing the valves, and if the motor is a new one and the flywheel not marked, it will not be difficult to place figures on it.

Sometimes in overhauling the motor the amateur neglects to note whether the gears utilized to drive the magneto are marked. Usually the proper mesh is indicated on the teeth as shown in the illustration at B, which depicts a conventional method of assembly. If the wheel be not marked it should be with a prick punch. One tooth should be nicked on the intermediate gear and another indentation make on the other gears as indicated. One on the tooth and another against the space is the best way.

In timing, it must be borne in mind that any wear of the connecting rod bearings will alter the relative position of the flywheel to the indicator, and while this may not affect the setting of a timer to any great extent, it would alter that of the valves. To insure accurate results the timing should be obtained from the maker and by utilizing the figures on the flywheel it can be checked and remarked if necessary.

LINING UP CHAINS.

Where the chain drive is utilized, especially the single member, it is essential to line up the driving and driven sprockets to obtain the best results. Devices are provided for adjustment, but if the sprockets be suspected of being out of alignment they may be tested easily by extending a piece of string from the outside of the teeth of the forward to those of the rear member. The twine should be dropped below the top of the teeth and drawn tightly. If the string bear evenly on both sprockets it may be assumed that they are in line. A space between the twine and the metal will denote faulty adjustment and this should be remedied.

COLD AFFECTS GAS TANK PRESSURE.

The Prest-O-Lite Company, maker of gas tanks of that name, announces that the pressure of these members is affected by temperature. The correct pressure should be 225 pounds or 15 atmospheres at 65 degrees Fahrenheit. When the tank is chilled, however, the pressure drops rapidly, and a decrease of 49 degrees will cause it to drop one-half. Nine to 10 atmospheres, or from 135 to 150 pounds, in cold weather is not unreasonable. To prove the effect of temperature upon the pressure, place a tank that has been exposed to the cold in a room of normal temperature and note the results.

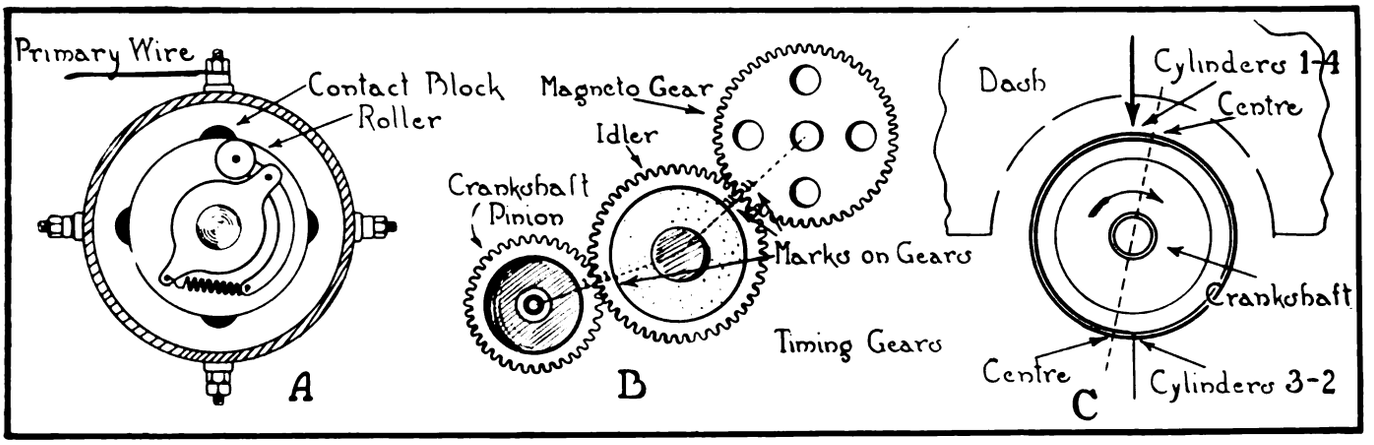


Fig. 2—Some Ignition Timing Suggestions: A, Position of Timer with Contact About to Break; B, Marking Gears Which Drive the Magneto; C, Dash Device and Diagram for Marking Time of Ignition.

KENNEDY HEADS ALCO COST BUREAU.

W. P. Kennedy has been appointed head of the transportation cost bureau of the truck department of the American Locomotive Company, New York City, and will devote his energies to transportation problems with which subject he is thoroughly conversant, having been connected with the commercial car industry for some time. He states that there is a tremendous waste of money through the failure of the users of the horse drawn equipment to systematize their hauling methods, and estimates that by proper use of the automobile a saving from 15 to 40 per cent, may be effected.

The object of the cost bureau is to analyze the various hauling systems in a scientific way and tabulate the results carefully, providing actual figures and working diagrams, and demonstrating the saving of motor cars over horses.

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The MOTOR TRUCK
Devoted to Motor Driven Business Vehicles of All Classes.

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PROGRESS REVEALED BY SHOWS.

Those who have been watching the commercial vehicle side of the industry cannot help but be impressed with its importance as reflected by the present show season. A little more than a year ago, when it was decided to hold separate exhibitions for industrial transports in New York and Chicago there were many who questioned the wisdom of the innovation. They were certain that the business of producing and selling this type of motor conveyance had not progressed sufficiently to warrant the undertaking.

But the success of the truck shows, so-called, in the two big centres where the scheme was given a trial, indicated clearly that while the motor truck situation might be considered more or less in its infancy, the possibilities of interesting prospective purchasers were infinitely larger than had been anticipated. Compared with the business transacted at the pleasure car displays, the result was such as to leave no possible room for doubt that the innovation was timely and well worth continuation.

The increased representation at the two national exhibits this year is sufficient indication of the manner in which the opportunity for displaying motor trucks is regarded by the manufacturers. That they have not misplaced their confidence in the buying public is borne out by the attendance and business transacted. The industrial transport is an established institution, and the commercial vehicle show may be regarded as a permanent fixture. The production and sale of these cars no longer is an infant industry and the success of the present show season is but one of the indications of its wonderful progress.

SERVICE AN IMPORTANT FACTOR.

Last summer, during the protracted heated period, large numbers of horses were overcome in the cities, especially, and the increase in the sale of commercial motor vehicles was decidedly marked in consequence. The cold wave of the past month, accompanied as it was by snow and ice, presented still another argument in favor of motor trucks, and the buying public was not slow to appreciate its essential points. Coming in connection with the national show in New York City, it is probable that it will have a decided effect upon the business to be done in this field the coming season.

Whether or not the motor truck is able to effect a saving in dollars and cents, although this position can be proven in nearly every instance, there is the matter of service to be taken into consideration. Antequated methods of doing business must be relegated to the rear, so soon as it is demonstrated that something more modern is offered. There can be no doubt that the power wagon solves the question of service under any and all circumstances, and is not in the least affected by the weather.

When the streets are filled with snow and ice, as when the heat is so intense that horses cannot be relied upon to do their work, the motor truck covers its route as regularly as under the most ideal conditions. Those who have been accustomed to gauge their business capacity by the ability of their horse drawn equipment to meet these conditions, are compelled to realize that the firm which employs a thoroughly dependable system of delivery, for instance, secures the business which rightly belongs to them. The obvious solution is to meet the problem in the same manner as the competitor, and since the motor truck has reached a point where it can be depended upon, there is little reason for failing to grasp the opportunities presented.

MEETING THE BODY PROBLEM.

There seems little doubt that the question of bodies will be of decided moment throughout the coming season. This applies to all forms of transports, but in no case is it more true than with the smaller wagon, such as may be used by retail stores. In many instances these firms have built up a delivery system after much careful thought and experimentation, and it is hardly to be expected that they will consider the newer method of transportation without judging its effect upon this system.

It may be possible to evolve some standard types of bodies which will meet a large number of requirements, but it is a situation which calls for much careful consideration by manufacturers. It is by no means essential that the buyer shall rearrange his whole method of doing business in order to avail himself of the possibilities offered by the modern vehicle. It is necessary, therefore, for both sides to give thought to the question of bodies before determining the suitability of the particular wagon for the work to which it is to be put.

This means quite as much to the maker as to the purchaser. One delivery wagon carefully placed may mean the sale of a dozen others—perhaps many more—because there are few business men who are unable to influence their friends in this regard. On the other hand, a mistake in the equipment of one machine may be sufficient to affect as many sales in the opposite manner. The importance of the situation cannot be over-estimated.

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RECENT MOTOR VEHICLE PATENTS

Valve Grinding Device.

In grinding valves of the poppet type an oscillating motion of the tool is desirable. A patent has been granted to De Will G. Vaughn, Richmond, Va., assignor of one-half to Dallas A. Shaffer of that city, for a device which embodies this feature. It comprises a shaft fitted with a worm which actuates a longitudinal sleeve and rotates the shaft. A tubular extension is provided with a bit and motion is imparted to the latter by means of a handle. Each portion of the two-part telescopic shaft rotates independently and one is fitted with a number of longitudinal slots at one end, the other member being equipped with a pin adapted to enter any one of the recesses. A spring is also attached for the purpose of separating the tubes and disengaging the connection. The oscillating movement is obtained by longitudinal pressure and release.

Electric Speed Limit Signal.

A patent for a speed limit signalling apparatus has been granted Fabius M. Butler, David City, Neb., which is operated by electricity and rings a bell when an indicated speed is reached by the vehicle. The dial of a speedometer is fitted with contact members as is another part, these being connected electrically. When the indicating hand of the speedometer touches the 10-mile contact, for example, the current flows to the bell. A lever is attached to the regulating device and may be set to sound an alarm at any desired speed. This arm is connected to a visible index, which shows but one number at a time, and is provided with an electric lamp.

Automobile Hood.

An automobile hood so constructed that its hinges are joint tight and weather proof, has been designed and patented by Henry G. Baum, York, Penn., assignor of one-half to the Pullman Motor Car Company of that place. The close joints are obtained by every alternating lip of the members being rolled backward upon itself to engage a binding or pivot rod, and the remaining lips extending under the surface of the corresponding rolled members.

Resilient Wheel.

Isaac Jay, Pendleton, Ore., has been granted a patent for a resilient wheel, the rim of which is fitted with a number of U shaped pieces in pairs and to these are bolted one end of eight curved spokes. The other ends of these members are attached to the hub by plates and bolts.

Automobile Buffer.

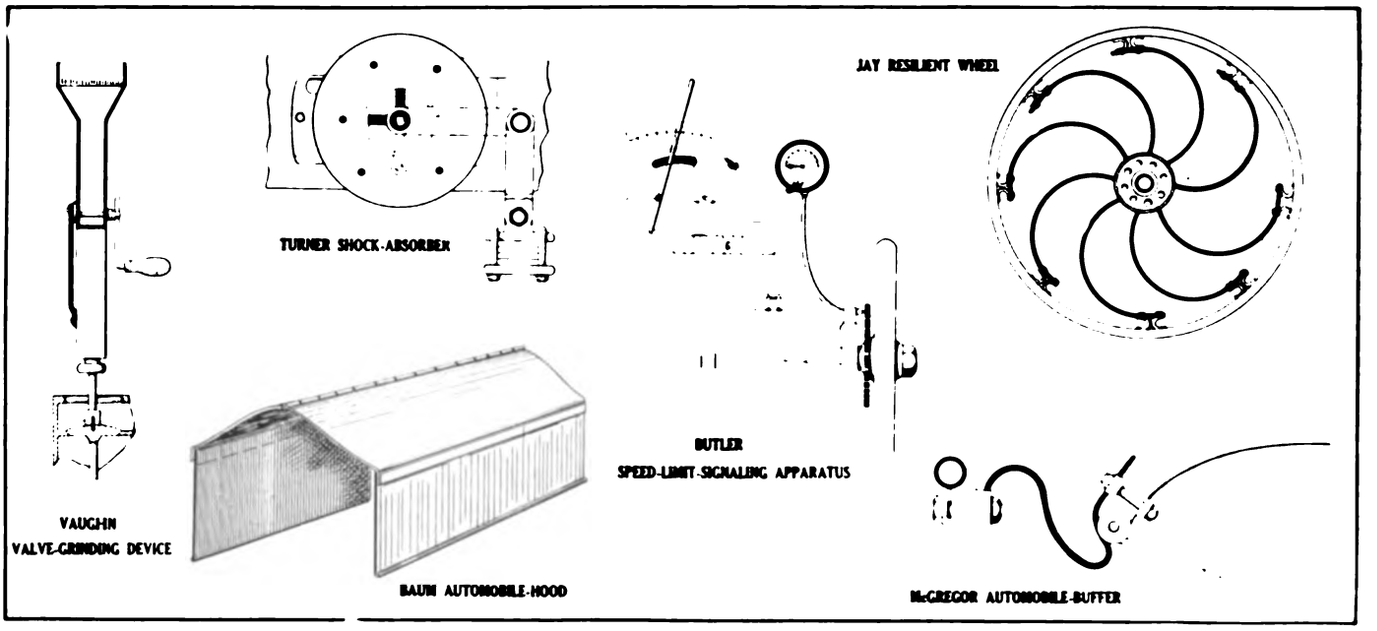
A novel form of automobile buffer designed for motor vehicles operating in heavy traffic, has been patented by Allan L. McGregor, Chicago. The buffer bar is carried in clamps which are slotted and locked by a bolt and nut. To this member is attached one end of the two S shaped springs. The other ends are fitted to clamps bolted to the frame extension in proximity to the spring.

Turner Shock Absorber.

A shock absorber operating on the friction principle has been patented by Harry C. Turner of Los Angeles, Cal. It consists of a stationary case with a revoluble sleeve mounted therein, and an arm attached to rotate this. The extension is pivotally mounted and connected with a similar member fastened to the spring. The interior of the case carries a ratchet member which is fitted with a number of spring pressed dogs, which engage it and rotate another movable part. This is fitted with friction plates which operate in different directions. Contact between the stationary plate and friction members is maintained by an annular spring between a screw cap and stationary disc.

MONTREAL SPACE IS LIMITED.

The week of Feb. 3-10 has been selected as the date for the annual national Canadian automobile show in the Drill Shed at Montreal. The demand for space has exceeded all previous records, and Manager E. M. Wilcox is having trouble trying to locate many who desire opportunity to make display. A number of vehicles will be shown in Canada for the first time at this exhibit.



Some Recently Patented Ideas of Inventors of Interest to the Manufacturer of Commercial Vehicles and Allied Trades.

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PROSPECTIVE PURCHASERS' GUIDE TO OFFERINGS

Tabulated Detailed Specifications of 1912

MAKE.	Load Capacity.	POWER PLANT: Cylinders.	How Cast	Bore	Stroke	Power	Carburetion	Ignition	Lubrication	COOLING: Circulation	Radiator	Clutch	TRANSMISSION: Form	Speeds	Location
Half-Ton and Less.															
New Era*	400	1	.....	3.6	3.7	6.0	Float Feed	Delco	Splash	Air	.....	Band	Plan	2	With Motor
Maxim*	500	2	Sep	3.2	4.5	8.5	Own	Magneto	Splash	Air	.....	.....	Hydrau	...	With Motor.
Reo	500	1	.....	4.7	6.0	12.0	Own	Jump Spark	Force Feed.	Thermo	.....	Disc	Plan	2	With Motor.
Auburn	600	2	Sep	4.1	3.7	13.6	Float Feed	Jump Spark	Force Feed	Thermo	H'comb	Disc	Plan	2	Amidships.
Brush	600	1	.....	4.0	5.0	10.0	Kingston	Bosch	Force Feed	Air	.....	Plate	Plan	...	With Motor
Duryea	600	2	Sep	3.7	3.7	12.0	Heiger	Jump Spark	With Fuel	Air	.....	.....	Roller	...	C. S.
Kearns	600	3	Sep	4.0	4.0	20.0	Schebler	Unisparker	.....	Air	.....	.....	Friction	...	Amidships.
Best	800	2	Sep	4.5	4.5	12.0	Kingston	Dual	Pump	Thermo	F. Tube	.....	Friction	...	Amidship.
Chicago Bus	800	2	Sep	4.1	4.0	14.0	Float Feed	Jump Spark	Spl. & Pump	Air	.....	.....	Friction	...	.....
Detroit	800	2	Sep	4.0	4.0	16.0	Float Feed	Bosch	Force Feed	Thermo	Tubular	Disc	Plan	2	At Jackshaft.
Lincoln	800	2	Block	4.1	4.0	14.0	Schebler	Jump Spark	Force Feed	Air	.....	.....	Friction	...	.....
McIntyre	800	2	Sep	4.1	3.7	13.6	Float Feed	Jump Spark	Force Feed	Thermo	Tubular	Disc	Plan	2	With Jacksh.
Overland	800	4	Sep	4.0	4.5	30.0	Schebler	Splitdorf	Force Feed	Thermo	Tubular	Cone	Select	3	Rear Axle...
Acorn	1,000	2	Sep	5.0	4.0	20.0	Schebler	Jump Spark	Force Feed	Thermo	Tubular	.....	Friction	....	Amidship...
Beyster	1,000	4	Block	3.5	5.0	20.0	Float Feed	Bosch	Splash	Thermo	H'comb	Plate	Plan	2	Amidship...
Blacker	1,000	2	Sep	4.0	4.0	13.0	Schebler	Battery	Splash	Air	.....	Band	Select	2	Amidship...
Board	1,000	4	Block	3.7	5.2	28.0	Schebler	Bosch	Force Feed	Pump	H'comb	Cone	Select	3	Back Motor.
Buick	1,000	2	Sep	3.5	5.0	22.0	Schebler	Remy	Force Feed	Pump	Tubular	Cone	Plan	2	With Motor.
Champion	1,000	4	Pairs	4.2	5.0	35.0	Float Feed	Simms	Force Feed	Pump	Tubular	Disc	Select	3	Amidship...
Cino	1,000	4	Pairs	4.3	5.0	40.0	Stromberg	Remy	Spl. & Pump	Pump	Tubular	M. D. c.	Select	3	Amidship...
Economy	1,000	2	Sep	4.5	5.0	20.0	Schebler	Magneto	Force Feed	Pump	H'comb	Cone	Plan	2	Amidship...
Geneva	1,000	2	Sep	5.2	4.5	20.0	Schebler	Bosch	Force Feed	Pump	Tubular	Disc	Plan	2	With Jacksh.
Gleason	1,000	2	Sep	4.0	4.7	20.0	Schebler	Remy	Force Feed	Thermo	Tubular	Disc	Select	3	Amidship...
Hatfield	1,000	3‡	Sep	4.1	4.0	20.0	Holley	Bosch	With Fuel	Air	.....	.....	Friction	....	.....
International	1,000	2	Sep	5.0	4.0	14.0	Schebler	Bosch	Mechanical	Air	.....	Band	Pat	2	Back Motor.
Jonz	1,000	3	Sep	3.7	4.2	22.0	Schebler	Bosch	Force Feed	Pump	H'comb	Plate	Select	3	Rear Axle...
Lambert	1,000	2	Sep	5.2	4.0	20.0	Schebler	Remy	Pump	Pump	Vertical	.....	Friction	....	Amidship...
Mercury	1,000	2	Sep	4.2	4.0	14.0	Own	Battery	Spl. & F. F.	Air	.....	Plate	Plan	2	With Motor.
Merit	1,000	2	Sep	4.7	4.7	18.0	Schebler	Jump Spark	Spl. & F. P.	Air	.....	Disc	Friction	4	Amidship...
Modern B	1,000	4	Block	3.7	4.5	22.0	Float	Eisemann	Spl. & F. F.	Pump	.....	Cone	Select	3	Amidship...
Regal LB	1,000	4	Pairs	4.1	4.0	30.0	Float	Michigan	Spl. & Pump	Thermo	Tubular	Cone	Select	3	Rear Axle...
Rogers	1,000	2	Sep	4.7	4.0	18.0	Kingston	Bosch	Force Feed	Air	.....	.....	Friction	....	Amidship...
Schmidt	1,000	2	Sep	4.7	4.7	18.0	Schebler	Simms	Spl. & F. F.	Air	.....	Disc	Plan	2	With Motor.
Sullivan	1,000	2	Sep	4.5	4.5	18.0	Schebler	Bosch	Force Feed	Thermo	Tubular	Cone	Plan	2	With Motor.
Van Dyke	1,000	2	Sep	4.5	6.0	22.0	Schebler	Magneto	Mechanical	Pump	Tubular	.....	Friction	....	Amidship...
Warren	1,000	4	Block	4.0	4.5	30.0	Float Feed	Bosch	Spl. & Pump	Pump	Tubular	Cone	Select	3	Amidship...
Half-Ton to One Ton.															
Auburn	1,200	2	Sep	4.7	4.7	20.0	Float Feed	Remy	Force Feed	Air	.....	.....	Plan	2	With Motor.
Siebert	1,250	2	Sep	5.0	4.0	20.0	Carter	Simms	Splash	Thermo	Tubular	Plate	Plan	2	With Jacksh.
Atlas	1,500	2	Pairs	4.5	4.5	20.0	Float Feed	Atw't'r-Kent	With Fuel	Pump	H'comb	Plate	Select	3	With Motor.
Cartercar	1,500	2	Sep	4.5	5.0	18.0	Schebler	Remy	Mechanical	Thermo	Tubular	.....	Friction	....	Amidship...
Chase D	1,500	3‡	Sep	4.1	4.0	20.0	Holley	Bosch	With Fuel	Air	.....	.....	Plan	2	With Jacksh.
Coleman	1,500	2‡	Sep	4.5	4.5	20.0	Float Feed	J. W.	With Fuel	Pump	.....	Plate	Select	2	Amidship...
Cortland	1,500	2	Sep	4.2	4.2	16.0	Breeze	Remy	Force Feed	Thermo	Tubular	Cone	Plan	2	Amidship...
Crown	1,500	4	Sep	3.7	4.5	26.0	Schebler	Remy	Mechanical	Thermo	Tubular	M. Disc	Select	3	Amidship...
Dart	1,500	2	Sep	4.2	5.0	16.0	Float Feed	Splitdorf	Force Feed	Thermo	H'comb	Disc	Plan	2	With Motor.
Denniston	1,500	2	Block	4.0	4.7	15.0	Float Feed	Bosch	Spl. & Pump	Pump	H'comb	Plate	Select	3	With Motor.
Gaylord	1,500	4	Pairs	4.0	5.0	30.0	Schebler	Remy	Force Feed	Pump	Tubular	Disc	Select	3	Rear Axle...
Ideal	1,500	4	Pairs	3.5	4.2	24.0	Float Feed	Bosch	Spl. & F. F.	Thermo	Tubular	D. & C.	Select	3	With Jacksh.
Johnson	1,500	4	Pairs	4.5	5.2	40.0	Stromberg	Optional	Splash	Pump	H'comb	Cone	Select	3	Amidship...
Kearns	1,500	3‡	Sep	4.0	4.0	20.0	Schebler	Unisparker	With Fuel	Air	.....	.....	Friction	....	.....
Kisselkar	1,500	4	Pairs	4.2	4.2	30.0	Stromberg	Bosch	Splash	Pump	H'comb	Cone	Select	3	Amidship...
Lincoln	1,500	2	Block	4.1	4.0	14.0	Schebler	Jump Spark	Force Feed	Air	.....	.....	Friction	....	.....
Lippard-Stewart	1,500	4	Block	3.3	4.3	20.0	Float Feed	Bosch	Pump	Thermo	H'comb	Plate	Select	3	Amidship...
McIntyre	1,500	2	Sep	5.2	4.0	22.5	Float Feed	Briggs	Splash	Thermo	Tubular	Disc	Plan	2	With Jacksh.
Maytag-Mason	1,500	2	Sep	5.0	5.0	20.0	Schebler	Jump Spark	Spl. & F. F.	C. Pump	Vertical	Cone	Plan	2	.....
Menominee	1,500	4	Pairs	4.7	4.5	25.0	Schebler	Eisemann	Pump	Pump	Tubular	Disc	Select	3	With Motor.
Modern	1,500	4	Block	4.3	5.0	30.0	Float Feed	Jump Spark	Spl. & F. F.	Pump	.....	Cone	Select	3	With Jacksh.
Monitor	1,500	4	Sep	5.0	4.0	20.0	Schebler	Dual	Force Feed	Pump	H'comb	Cone	Plan	2	Amidship...
Mora	1,500	2	Sep	4.5	4.5	16.0	Float Feed	Magneto	Force Feed	Thermo	H'comb	Disc	Plan	2	With Jacksh.
Oliver	1,500	2	Sep	5.0	5.0	24.0	Float Feed	Mea	Force Feed	Thermo	Tubular	Disc	Plan	2	With Motor.
Philadelphia	1,500	4	Pairs	3.6	4.7	25.0	Schebler	Bosch	Splash	Pump	.....	Plate	Select	3	Amidship...
P H P	1,500	4	Block	4.0	4.5	30.0	Float Feed	Splitdorf	Spl. & F. F.	Pump	Tubular	Disc	Select	3	With Motor.
Reo	1,500	1	.....	4.7	6.0	12.0	Own	Jump Spark	Spl. & F. F.	Thermo	H'comb	Disc	Plan	2	With Motor.
Sampson	1,500	2	Sep	4.7	4.7	18.0	Float Feed	Jump Spark	Spl. & F. F.	Thermo	Tubular	Plate	Select	3	Amidship...
Schacht	1,500	4	Block	4.3	5.0	40.0	Schebler	Mea	Spl. & Pump	Pump	H'comb	Cone	Select	3	Amidship...
Sullivan	1,500	2	Sep	4.5	4.5	18.0	Schebler	Jump Spark	Force Feed	Thermo	Vertical	Cone	Plan	2	With Motor.
Veerac	1,500	2	Sep	4.0	4.0	20.0	Holley	Jump Spark	With Fuel	Air	.....	Disc	Plan	2	With Jacksh.
Victor	1,500	4	.....	3.7	4.5	25.0	Schebler	Bosch	Spl. & F. F.	Pump	H'comb	Disc	Select	3	.....
Webster	1,500	2	Block	4.5	4.0	16.0	Schebler	.....	Force Feed	Air	.....	.....	Plan	2	Amidship...
White	1,500	4	Block	3.7	5.1	30.0	Own	Bosch	Spl. & F. F.	Pump	H'comb	Cone	Select	4	Amidship...
Whitesides	1,500	4	Block	4.5	4.5	30.0	Marvel	Splitdorf	Splash	Thermo	H'comb	Disc	Plan	2	Amidship...
Willet	1,500	3‡	Sep	4.5	4.5	30.0	Float Feed	Mea	Force Feed	Thermo	.....	Plate	Select	3	Amidship...
Adams	2,000	4	Block	3.8	5.0	30.0	Kingston	Eisemann	Spl. & F. F.	Pump	Tubular	Disc	Select	3	Amidship...
Atterbury	2,000	4	Block	4.0	4.5	25.6	Schebler	Bosch	Spl. & F. F.	Pump	Tubular	Plate	Select	3	With Motor.
Bessemer	2,000	4	Block	4.7	5.2	20.0	Stromberg	Bosch	Force Feed	Thermo	Tubular	Cone	Select	3	With Jacksh.
Blacker	2,000	4	Pairs	4.1	5.2	25.0	Special	Bosch	Splash	Pump	.....	Band	Select	3	Amidship...
Board	2,000	4	Block	4.1	5.2	32.0	Schebler	Bosch	Force Feed	Pump	H'comb	Disc	Select	3	With Jacksh.
Cass	2,000	4	Block	4.0	4.5	30.0	Kingston	Bosch	Pump	Thermo	.....	Cone	Slid	2	Amidship...
Chase	2,000	3‡	Sep	4.1	4.0	20.0	Float Feed	Bosch	With Fuel	Air	.....	Cone	Select	3	With Jacksh.
Clark	2,000	2	Sep	5.0	5.5	24.0	Schebler	U. & H.	Force Feed	Thermo	.....	Cone	Slid	2	Amidship...
Clark	2,000	4	Block	3.7	5.0	30.0	Float Feed	Eisemann	Force Feed	Thermo	H'comb	Disc	Select	3	Amidship...
Decatur	2,000	4	Sep	4.0	4.0	30.0	Float Feed	Simms	.....	Pump	.....	Disc	Select	3	Amidship...

* Tricar. † Pulls 5 tons on Trailer. ‡ Two-cycle. §§ Four Wheel Drive. †† Front Drive. *a* To 740.

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OF TRUCK MANUFACTURERS FOR COMING SEASON.

Standard Gasoline Commercial Vehicles.

Half-Ton and Less.

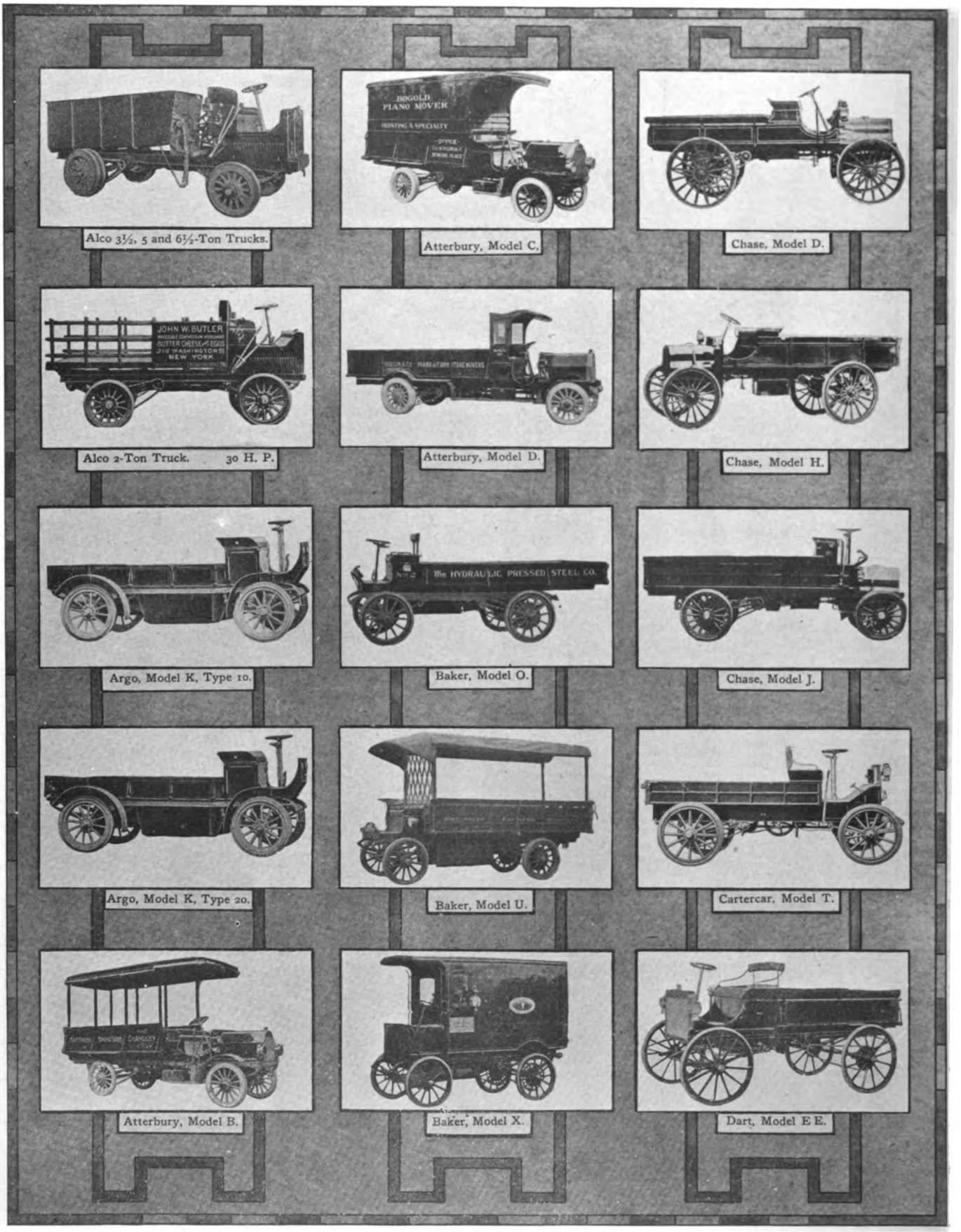
Final Drive	Tires Front	Tires Rear	Front Axle	Springs Front	Springs Rear	Steering	Brakes Emergency	Brakes Service	Frame	Body Length	Body Width	Overall Length	Overall Width	Wheelbase	Tread	Chassis Weight.	Maximum Speed	Seat Location.	List Price.
Ch...	26x3..	26x3.....	Tubular...	Semi-ell	.....	Own....	Exp....	.....	Pressed Steel .	48	28	116	58	72	50	450	35	Above ..	$ 425
Ch...	28x2 5	28x2 5...	.....	.....	Semi-ell	Own....	Hubs ..	Hub ..	Tubular Steel .	39	36	125	55	90	47	600	25	Behind..	395
Ch...	29x3 5	29x3 5...	Forged...	Ell.....	Round...	Pin.....	Rever..	Hubs..	AngleSteel....	72	48	...	...	78	60	1,100	20	Above ..	600
Chs...	30x3..	30x3.....	Wood....	Full ell .	Full-ell .	Own....	Hubs..	Hubs..	Wood	46	27	103	56	77	56	1,100	16	Above ..	685
4 Ch	34x1 3	34x1 3...	D. Forged	½-ell.....	Full-ell .	Own....	.....	Trans.	Angle Steel....	51	37	121	64	88	54	1,375	24	Behind.	487
Roller	..x1 5	x1 6....	Channel...	½ ell	Semi-ell..	Own....	Hubs..	.....	Pressed Steel .	65	36	126	56	84	56	850	20	.....	500
Chs...	36x1 2	36x1 5...	Square...	Full-ell .	Full ell ..	Worm..	Hubs ..	Rever ..	Angle Steel....	...	...	...	....	100	56	1,225	30	Behind..	900
Chs...	32x2..	34x2.....	Square...	Semi-ell.	Full ell .	Platf....	Rever ..	Hubs..	Angle Steel....	63	40	116	....	76	56	.....	18	Above...	.....
Chs...	38x2..	38x2.....	Square...	Full-ell .	Full-ell .	Own....	Rever ..	Hubs..	Pressed Steel .	59	40	125	....	87	56	1,100	25	Above ..	.....
Chs...	32x2..	32x2 5...	Tubular...	Semi ell.	Full-ell .	Spur....	Hubs..	J. S...	Channel Steel.	66	44	132	62	100	56	1,770	15	Behind.	610a
Chs...	38x2..	38x2.....	Square...	Full-ell .	Full-ell .	Own....	Exp ..	Exp ..	Pressed Steel .	38	72	144	65	87	56	1,200	20	Above ..	575
Chs...	x1 3	x1 3.....	Square...	Semi-ell.	Full ell .	Own....	Hubs..	Hubs..	.....	...	...	...	....	.....	.....	.....	.....	Behind .	650
Shaft	33x4..	33x4.....	I beam ...	Semi-ell.	½-ell.....	Worm...	Cont .	Exp...	Pressed Steel .	44	42	146	....	106	56	.....	45	Behind .	900
Chs	34x2 5	34x2 5 .D	Tubular...	Full-ell .	Full-ell .	Own....	.....	.....	Steel	79	44	136	64	96	56	1,900	20	Above...	.....
Chs...	x3..	3.5.....	I-beam ...	Semi ell	Platf	.....	J. S...	Hubs..	Channel Steel .	72	42	110	60	106	56	1,800	20	Behind .	1,250
Ch	30x3..	30x3.....	Tubular...	Full ell .	Full ell ..	Own....	.....	Hubs..	Angle Steel....	...	...	...	....	86	56	1,300	15	Behind..	650
Shaft	34x2 5	34x3.....	I beam ...	Semi-ell.	Platf....	Warn....	Cont..	Exp ..	Channel Steel..	78	48	168	62	110	56	.....	.....	Behind..	1,375
Chs...	32x4..	32x4.....	I beam ...	½-ell	Semi-ell.	Pin	Hubs..	Hubs..	Angle Steel....	76	42	139	70	92	56	2,200	30	Above...	1,000
Chs...	36x3.5	36x4.....	Forged ...	Semi-ell.	Platf....	Ross	Hubs	J. S...	Channel Steel.	132	60	168	68	124	58	4,000	15	Above...	2,500
Shaft	34x4..	34x4.....	I-beam....	Semi ell .	½ ell	Gemmer .	Hubs.	Hubs..	Pressed Steel .	63	36	157	66	113	56	.....	35	Behind..	2,000
Chs...	.....	.....	Square. ..	Full ell .	Full-ell .	Own....	.....	Hubs..	Angle Steel....	84	45	...	64	100	56	1,650	....	Above...	.....
Chs...	34x2..	36x2 5...	Solid	Semi-ell.	Full-ell .	Irrever..	.....	Exp...	Wood	58	45	144	66	96	56	1,915	18	Behind..	1,350
Shaft	36x2..	36x2.....	I-beam....	.....	.....	Worm ..	.....	Exp...	Pressed Steel .	71	48	96	32	48	32	1,500	30	Front...	1,050
.....	..x2..	..x2 5...	.....	Single ..	Semi-ell.	Own....	Cont..	Rever..	Angle Steel....	67	42	108	36	90	56	1,800	20	Side.....	850
Ch	x1 7	x1 7....	Square...	Full-ell .	Full-ell .	.....	Cont..	Exp...	Wood	...	...	...	....	84	56	.....	.....	.....	.....
Shaft	32x3.5	32x3 5...	I-beam....	Semi-ell.	½ ell	Own....	Hubs..	Hubs..	Pressed Steel .	54	36	...	....	96	56	1,500	20	Behind..	800
Ch	38x2..	38x2.5...	I beam....	Semi-ell.	Semi-ell.	Rose	Hubs..	J. S...	Channel Steel..	...	...	...	....	100	56	2,200	18	Behind..	1,250
Chs...	38x1 7	40x1 7...	Square....	Full-ell .	Full ell ..	Own....	Trans.	Hubs..	.....	72	40	108	68	85	56	1,500	15	Above...	750
Chs...	35x2..	35x2.....	I beam ...	Full-ell .	Full-ell .	Own....	Hubs..	Hubs..	Angle Steel....	77	42	131	69	88	56	1,770	18	Above ..	1,000
Chs...	33x4..	33x4.....	I beam ...	Semi ell .	Semi-ell.	Ross	Hubs	J. S ...	Pressed Steel .	72	42	...	....	110	56	1,850	25	Behind..	1,200
Shaft	32x3 5	32x3 5...	I beam ...	Semi-ell.	Full ell .	Own....	Hubs	Hubs..	Pressed Steel .	58	42	154	63	107	56	2,300	35	Behind .	1,050
Chs...	36x2 5	36x3.....	I beam ...	Trans ...	Full-ell .	Own....	Rever ..	Hubs..	Wood	60	48	142	68	100	56	1,600	18	Behind .	800
Chs...	36x2..	38x2.....	Square....	½ ell	Col.....	Ross	.....	Exp...	Channel Steel..	84	42	144	66	90	56	2,000	20	.....	1,025
Chs...	36x2 5	36x2 5...	Square ...	Full-ell .	Full ell .	Col.....	Trans	Hubs..	Angle Steel	60	38	141	65	92	56	1,700	18	Behind .	1,050
Shaft	32x3..	32x3.....	Tubular...	Semi-ell.	Platf....	Gemmer .	Hubs	Hubs..	Pressed Steel .	72	39	126	72	86	56	1,410	20	Side	850
Shaft	32x4..	32x4....	DI-beam ...	Semi-ell.	½-ell	Gemmer .	Hubs.	Hubs..	Pressed Steel .	64	43	150	59	110	56	.....	35	Behind .	1,350

Half-Ton to One Ton.

Chs...	34x1 7	34x2.....	.....	Full-ell .	Full-ell .	Own	Hubs..	Trans.	Angle Steel....	68	45	...	....	86	56	1,800	16	Above ..	750
Chs...	36x2..	36x2 5...	Square...	½-ell.....	Full-ell .	Worm...	Hubs..	J. S...	Angle Steel....	...	...	...	....	100	56.5	1,900	18	Behind..	1,000
Shaft	32x4 5	32x4 5...	I-beam...	Semi-ell.	Semi-ell.	Gemmer .	Hubs.	Trans.	Pressed Steel .	90	44	144	72	102	56	1,800	25	Behind..	1,750
Chs...	34x2 5	36x2 5...	Tubular...	Semi-ell.	Semi-ell.	Own....	Rever .	Hubs..	Pressed Steel .	74	44	138	66	98	56	2,000	22	Above...	1,250
Chs...	36x2..	38x2.....	I-beam....	Full-ell .	½-Platf..	Barnes....	.....	Band..	Wood	72	44	144	66	100	58	.....	15	Behind..	900
Chs...	..x2 5	..x2 5...	Square...	Ell.....	Ell.....	Foster....	J. S...	Hubs..	Angle Steel....	84	42	144	...	100	56	2,000	15	Above...	1,250
Chs...	36x2 5	36x2 5...	Square...	Full-ell .	½-Platf..	Worm...	Rever .	Hubs..	Wood	75	42	...	....	84	56	1,700	16	Above...	970
Chs...	36x2 5	36x3.....	Square...	Semi-ell.	Full-ell .	W. & S .	Cont..	J. S...	Channel Steel.	84	44	168	....	104	56.5	2,100	18	Behind .	1,200
Chs...	..x1 7	..x1 7...	Square...	Full-ell .	Full-ell .	Own....	Exp...	J. S...	Pressed Steel .	78	42	123	64	80	56	1,350	18	Above...	650
Shaft	32x4..	32x4.....	I-beam...	Semi-ell.	½-ell.....	Worm...	Hubs.	Trans.	Nickel Steel...	84	48	136	46	96	56	2,000	22	Above...	2,000
Shaft	32x4..	32x4.....	I-beam...	Semi-ell.	Platf....	W. & S .	Hubs.	Hubs..	Steel	66	32	150	63	112	56	2,000	30	Behind .	1,500
Chs...	36x2 5	36x3.....	.....	½-ell.....	½-ell.....	Own....	Hubs..	J. S...	Wood	96	44	153	68	109	56	2,100	18	Above...	1,500
Shaft	34x3..	34x3.....	I-beam...	Semi-ell.	Semi-ell.	Own....	Hubs.	Hubs..	Channel Steel.	102	46	147	80	112	56	.....	16	Above...	1,600
Chs...	..x2..	..x2.....	Square...	Full-ell .	Full-ell .	Gemmer .	Int....	Ext ..	Wood	72	48	136	64	100	56	1,500	....	Behind .	1,150
Shaft	35x4 5	35x4 5...	I-beam...	Semi-ell.	Semi-ell.	.....	Hubs.	Hubs..	Pressed Steel .	81	44	...	....	120	56	2,500	35	Behind .	1,750
Ch	38x2..	38x2.....	Square...	Full-ell .	Full-ell .	Own....	Rever .	Exp...	Pressed Steel .	72	38	144	65	87	56	1,200	20	Above ..	785
Shaft	34x4..	34x4.....	I-beam...	Full-ell .	Semi-ell.	W. & S .	Hubs.	Hubs..	Pressed Steel .	72	45	162	70	115	56	2,200	25	Behind .	1,675
Chs...	x1 7	..x2.....	Square...	Full-ell .	Full-ell .	Own....	Hubs.	Hubs..	Channel Steel.	68	45	...	....	96	56	2,000	17	Behind .	950
Ch	32x3 5	32x3 5...	Tubular...	Semi-ell.	Full-ell .	S. & N .	Hubs.	.....	Pressed Steel .	50	40	...	....	...	...	850	30	Above ..	.....
Shaft	32x3..	32x3.....	I-beam...	Semi-ell.	Platf....	W. & S .	Hubs.	Hubs..	Channel Steel.	78	42	163	69	112	56	2,250	20	Behind .	1,200
Chs...	36x3..	36x3.5...	I-beam...	Semi-ell.	Semi-ell.	W. & S .	Hubs.	J. S ...	Pressed Steel .	78	42	...	....	114	56	.....	20	Behind .	1,600
Shaft	33x2 5	34x3.....	I-beam...	Semi-ell.	Full-ell .	Ross....	Hubs.	Cont..	Pressed Steel .	86	43	124	60	100	56	2,200	25	Above ..	1,050
Chs...	36x2..	36x2.5...	Square...	Semi-ell.	Semi-ell.	.....	Exp...	Hubs..	Pressed Steel .	80	45	150	69	94	56	2,000	20	Behind .	1,000
Shaft	38x2 5	38x2 5...	I-beam...	Semi-ell.	Semi-ell.	Lavigne .	Hubs.	Sh....	Pressed Steel .	72	44	...	....	100	56	2,500	18	Behind .	1,400
Shaft	32x4..	32x4.....	I-beam...	Full-ell .	Semi-ell.	Worm...	Hubs.	Hubs..	Pressed Steel .	84	52	...	....	112	56	2,065	25	Above...	2,000
Shaft	30x4..	30x4.....	I-beam...	Semi-ell.	Full-ell .	Foster....	Hubs.	Hubs..	Pressed Steel .	84	38	...	....	102	56	2,000	25	Side	1,050
Chs...	36x2..	36x2 5...	.....	Semi-ell.	Full-ell .	Own....	Hubs.	J. S...	Pressed Steel .	84	48	144	..	90	60	1,550	14	Above ..	750
Shaft	34x4 5	34x4 5...	Square...	Semi-ell.	½-Platf..	W. & N .	Hubs.	Hubs..	Pressed Steel .	72	43	142	68	94	56	2,000	20	Behind .	.....
Shaft	34x4..	34x4.....	I-beam...	Semi-ell.	½-ell.....	Barnes....	Hubs.	Hubs..	Pressed Steel .	60	40	158	64	120	56	2,300	45	Behind .	1,585
Chs...	36x2 5	36x2 5...	Square...	Full-ell .	Full-ell .	.....	Trans.	Hubs..	Angle Steel....	72	42	150	63	110	56	1,800	18	Behind .	1,000
Chs...	35x4..	35x4.....	I-beam...	½-ell.....	Full-ell .	Foster....	Trans.	Hubs..	Wood & Steel..	85	41	138	68	82	56	1,700	18	Above ..	850
Chs...	34x2 5	34x3.....	.....	Semi-ell.	Semi-ell.	Worm...	Hubs..	J. S...	Channel Steel.	84	42	...	....	105	56	.....	.....	.....	1,700
Chs...	..x1 7	..x1 7...	Square...	Semi-ell.	Full-ell .	Own....	.....	Hubs..	Wood & Steel.	60	35	132	40	93	56	.....	20	Behind .	.....
Shaft	34x4..	34x4.5...	I-beam...	Semi-ell.	Semi-ell.	W. & S .	Hubs.	Hubs..	Ch. Nick. Steel	89	50	170	77	120	56	2,535	30	Behind .	2,100
Chs...	..x2 5	x2 5....	I-beam...	Full-ell .	Full-ell .	Ross....	Exp...	Shaft..	Wood & Steel.	150	...	...	....	118	56	.....	.....	.....	1 500
Shaft	34x4 5	34x4 5...	I-beam...	Semi-ell.	Semi-ell.	.....	Exp...	Cont..	Pressed Steel .	84	40	...	....	110	56	2,300	17	Above ..	1,800
Chs...	36x3..	36x3.5...	.....	Semi-ell.	Semi-ell.	Detw....	Hubs.	J. S...	Pressed Steel .	106	46	200	70	121	56	3,200	15	Behind .	2,100
Chs...	36x3.5	36x4.....	I-beam...	Semi-ell.	Semi-ell.	Own....	Hubs.	Hubs..	Pressed Steel .	96	48	...	....	125	56	3,000	20	Behind .	.....
Chs...	34x2 5	34x3.....	I-beam...	Semi-ell.	Platf....	Own....	Hubs.	J. S...	Pressed Steel .	80	48	160	64	105	56	2,100	18	Behind .	1,950
Chs...	32x4..	32x4.....	C. St....	Full-ell .	Platf....	Ross....	Hubs.	J. S...	Channel Steel.	...	...	...	....	98	50.5	2,700	12	Above ..	2,250
Chs...	36x3.5	36x4.....	I-beam...	Semi-ell.	Platf....	Warner .	Exp...	Hubs.	Rolled Steel...	96	48	183	62	120	56	.....	18	Behind .	1,975
Chs...	34x3.5	34x4.....	Square...	Semi-ell.	Platf....	Ross....	Hubs.	Hubs..	Steel	90	64	192	72	116	56	3,200	16	Behind .	1,850
Chs...	36x2..	38x2.5...	Square...	Full-ell .	½-Platf..	Barnes....	Trans.	Hubs..	Wood & Steel..	82	44	156	75	106	58	.....	15	Behind .	1,400
Chs...	36x2.5	36x2.5...	Square...	Semi-ell.	Platf....	Ross....	Hubs.	J. S...	Pressed Steel .	96	45	...	....	102	56	2,000	....	Above ..	.....
Shaft	36x3.5	36x4.....	.....	Semi-ell.	Full-ell .	Ross....	.....	.....	Pressed Steel .	108	48	156	72	100	56	3,000	18	Above ..	2,000
Chs...	32x3..	32x3.5...	I-beam...	Semi-ell.	Platf....	Ross....	Hubs.	J. S...	Channel Steel.	132	66	...	....	129	56	2,800	....	Above ..	1,800

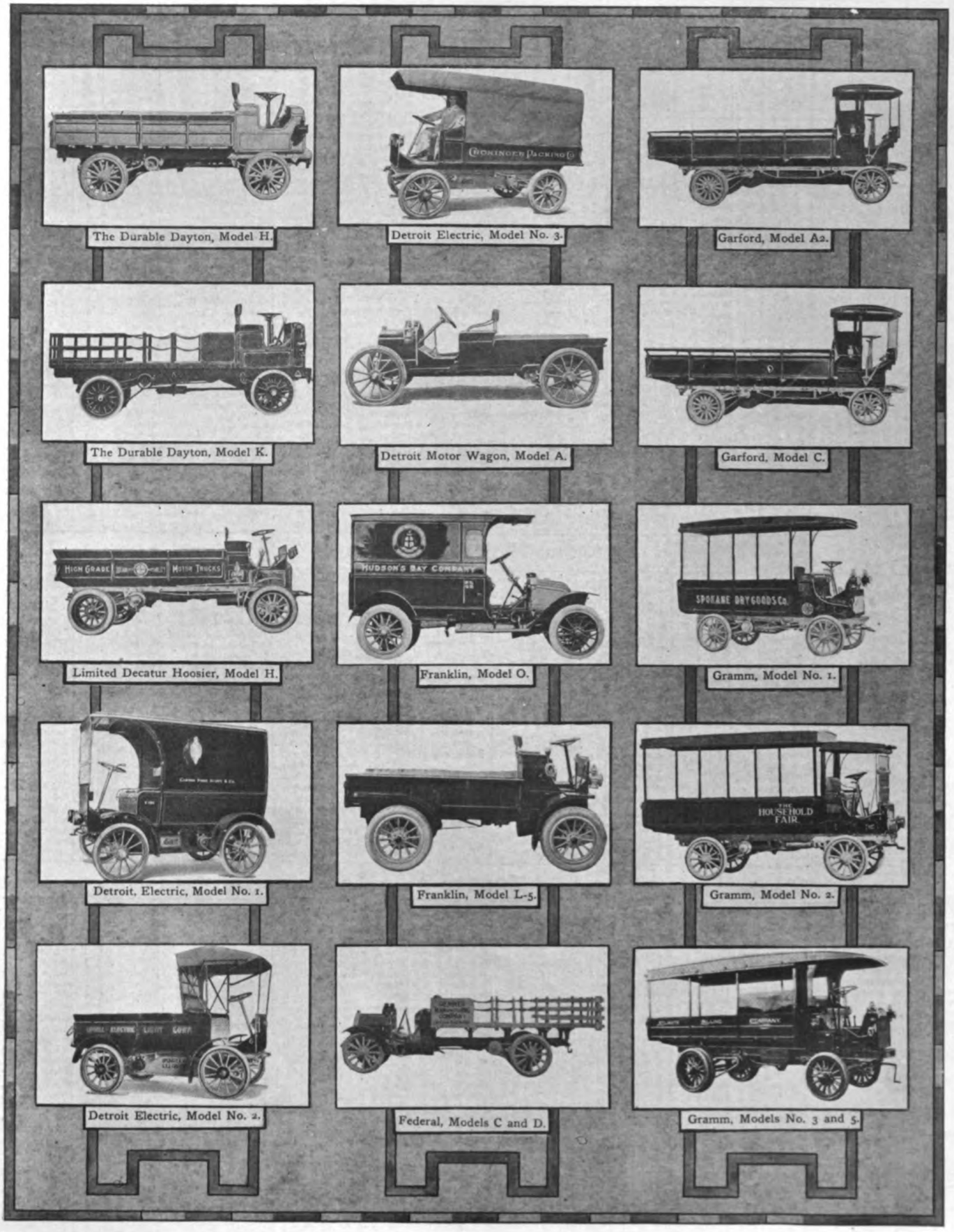
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Illustrating Standard Models for 1912.



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Illustrating Standard Models for 1912—Continued.



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Tabulated Detailed Specifications of 1912

MAKE.	Load Capacity.	POWER PLANT								COOLING			TRANSMISSION		
		Cylinders.	How Cast	Bore	Stroke	Power	Carburetion	Ignition	Lubrication	Circulation	Radiator	Clutch	Form	Speeds	Location
Dominion	2,000	4	Block	4.1	4.5	35.0	Stromberg	Bosch	Splash	Thermo.	Tubular	Cone	Select	3	With Jacksh.
Federal	2,000	4	Pairs	4.5	4.5	30.0	Stromberg	Bosch	Spl. & F. F.	Pump	Tubular	Cone	Select	3	Amidship
Franklin	2,000	4	Sep	3.3	4.0	18.0	Own	Bosch	Splash	Air		Disc	Select	3	Amidship
Garford	2,000	4	Pairs	4.0	3.7	26.0	Mayer	Splitdorf	Force Feed	Pump	Tubular		Friction		Amidship
G-M-C	2,000	4	Block	3.5	5.2	20.0	Schebler	Jump Spark	Splash	Pump	Tubular	Disc	Select	4	With Jacksh.
Grabowsky	2,000	4	Pairs	4.2	4.5	28.9	Float Feed	Bosch	Spl. & F. F.	Pump	H'comb.		Select	3	With Motor.
Gramm	2,000	4	Block	4.0	5.0		Float Feed	Bosch	Spl. & F. F.	Thermo.	Tubular	Disc	Select	3	Amidship
Hart-Kraft	2,000	4	Block	4.1	5.2	30.0	Schebler	Magneto	Spl. & Pump	Pump	Tubular	Cone	Select	3	Amidship
Hatfield	2,000	3‡	Sep	4.1	4.0	20.0	Holley	Bosch	With Fuel	Air			Friction		
Ideal	2,000	4	Pairs	3.5	4.2	24.0	Float Feed	Bosch	Spl. & Pump	Thermo.	Tubular	Plate	Select	3	With Jacksh.
Indiana	2,000	4	Sep	4.0	4.0	30.0		Bosch	Spl. & F. F.	Pump	Tubular	Disc	Select	3	With Jacksh.
Kisselkar	2,000	4		4.5	4.7	40.0	Stromberg	Bosch	Splash			Cone	Select	4	
Lambert	2,000						Breeze	Remy	Pump	Pump			Friction		Amidship
Lauth-Juergens	2,000	2	Sep	5.0	5.0	24.0	Schebler	Bosch	Force Feed	Thermo.	Pump	Disc	Select	3	Amidship
Little Giant	2,000	2	Sep	5.0	4.0	20.0	Schebler	Splitdorf	Mechanical	Thermo.		Disc	Plan	2	With Motor.
McIntyre	2,000	2	Sep	5.2	4.7	22.0	Float Feed	Briggs	Splash	Thermo.	Tubular		Plan	2	With Jacksh.
Mack	2,000	4	Pairs	4.5	5.5	32.0	Stromberg	Bosch	Spl. & F. F.	Pump	H'comb.	M. Disc	Select	3	With Jacksh.
Maytag-Mason	2,000	2	Sep	5.0	5.0	20.0	Schebler	Jump Spark	Spl. & F. F.	C. Pump	Vertical	Cone	Plan	2	
Monitor	2,000	2	Sep	5.2	4.7	24.0	Schebler	Bosch	Force Feed	Thermo.	Tubular	Cone	Select	3	Amidship
Natco	2,000	4	Block	3.5	5.0	20.0	Float Feed	Magneto	Force Feed	Thermo.	Tubular	Cone	Select	3	With Jacksh
Oliver	2,000	2	Sep	5.0	5.0	24.0	Float Feed	Mea	Force Feed	Thermo.	Tubular	Disc	Plan	2	With Motor.
P-H-P	2,000	4	Block	4.0	4.5	30.0	Float Feed	Jump Spark	Spl. & F. F.	Pump	Tubular	Disc	Select	3	With Motor.
Plymouth	2,000	4	Pairs	4.2	5.0	28.0	Float Feed	Splitdorf	Spl. & F. F.	Pump	Tubular		Friction		Amidship
Rassel	2,000	2	Sep	5.5	4.7	22.0	Schebler	Splitdorf	Force Feed	Thermo.	Tubular	Cone	Select	3	Amidship
Sanford	2,000	3	Sep	4.0	4.5	20.0	Float Feed	Bosch	Splash	Air		Cone	Plan	2	Amidship
Schmidt	2,000	2	Sep	5.0	5.0	20.0	Schebler	Simms	Spl. & F. F.	Air		Disc	Plan	2	With Motor.
Service	2,000	4	Block	3.7	5.2	30.0	Stromberg	Dual	Splash	Pump	Tubular		Friction		
Siebert	2,000	4	Block	3.7	5.2	30.0	Carter	Simms	Splash	Thermo.	Tubular	Disc	Slid	3	With Jacksh.
Stegeman	2,000	4	Block	3.7	5.2	30.0	Float Feed	Jump Spark	Spl. & F. F.	Pump	Tubular	Plate	Select	3	With Motor.
Tractor†	2,000	4	Block	4.1	4.5	30.0	Schebler	Bosch	Force Feed	Thermo.			Friction		Amidship
Utility	2,000	4	Pairs	4.2	5.0	35.0	Float Feed	Splitdorf	Force Feed	Pump	H'comb.		Friction		Amidship
Van-L	2,000	4	Pairs	3.7	4.0	24.0		Splitdorf	Spl. & Pump	Thermo.	Tubular	Cone		3	
Victor	2,000	4		4.0	4.5	30.0	Schebler	Bosch	Spl. & F. F.	Pump	H'comb.	Disc	Select	3	With Motor.
Westman	2,000	4	Block	3.7	5.2	30.0	Float Feed	Jump Spark	Spl. & F. F.	Pump	H'comb.	Cone	Select	3	On Front Ax.
Whitesides	2,000	4	Block			40.0	Marvel	Splitdorf	Splash	Thermo.	H'comb.	Disc	Plan	2	Amidship
Wilcox	2,000	4	Pairs	4.2	4.5	30.0	Bennett	Bosch	Splash	Pump	Tubular	Cone	Select	3	Amidship
Winkler	2,000	4	Pairs	4.2	4.0	25.0	Schebler	Splitdorf	Force Feed	Pump	Tubular	Disc	Prog	3	Amidship

One Ton to 1.5 Tons.

Brandon**	2,500	3	Sep	4.5	5.5	45.0	Schebler	K-W	Force Feed	Thermo.	Tubular	Own	Select	3	With Axles
Cortland	2,500	2	Sep	5.0	5.0	22.0	Float Feed	Jump Spark	Force Feed	Thermo.	H'comb.		Plan	2	Amidship
Eclipse	2,500	4		4.0	4.0	30.0	Stromberg	Bosch			Tubular	Cone	Select	3	With Jacksh
American Eagle	3,000	4	Pairs	4.0	5.0	25.6	Stromberg	Bosch	Spl. & F. F.	Thermo.	Tubular	Cone	Select	3	With Jacksh.
Autocar	3,000	2	Sep	4.7	4.5	18.0	Stromberg	Bosch	Force Feed	Pump	Tubular	Plate	Prog	3	Amidship
Blair	3,000	4	Block	4.1	5.2	30.0	Schebler	Bosch	Pump	Pump	Tubular	Cone	Select	3	Amidship
Chase	3,000	3‡	Sep	4.5	5.0	30.0	Float Feed	Jump Spark	With Fuel	Air		Cone	Select	3	With Jacksh.
Cortland	3,000	2	Sep	5.0	5.0	24.0	Schebler	Remy	Mechanical	Thermo.	Tubular	Cone	Plan	2	Amidship
Decatur	3,000	4	Sep	4.0	4.0	30.0	Rayfield	Simms	Force Feed	Pump	H'comb.	Disc	Select	3	Amidship
Dynamic	3,000	4	Block			30.0	Optional	Magneto	Force Feed	Pump	H'comb.	Disc	I. Cl.	2	Amidship
Garford	3,000	4	Pairs	4.7	5.2	40.0	Float Feed	Bosch	Splash	Pump	Tubular	Cone	Select	4	Amidship
Grabowsky	3,000	4	Pairs	4.2	4.5	28.9	Float Feed	Bosch	Spl. & F. F.	Pump	H'comb.		Select	3	With Motor.
Hart-Kraft	3,000	4	Block	4.1	5.2	30.0	Schebler	Magneto	Spl. & Pump	Pump	Tubular	Disc	Select	3	Amidship
Ideal	3,000	4	Block	4.1	5.2	35.0	Float Feed	Bosch	Spl. & Pump	Pump	Tubular	Cone	Select	3	With Jacksh.
Johnson	3,000	4	Pairs	4.2	4.5	30.0	Stromberg	Optional	Splash	Pump	H'comb.	Cone	Select	3	Amidship
McIntyre	3,000	4	Pairs	4.1	4.7	31.2	Float Feed	Briggs	Splash	Thermo.	H'comb.		Plan	2	With Jacksh.
Mais	3,000	4	Pairs	4.0	5.2	30.0	Rayfield	Eisemann	Spl. & F. F.	Thermo.	Tubular	Exp	Prog	2	With Motor.
Oliver	3,000	2	Sep	5.0	5.0	20.0	Stromberg	Mea	Force Feed	Thermo.	Tubular	Disc	Plan	2	With Motor.
Sampson	3,000	4	Pairs	4.0	5.0	25.0	Float Feed	Jump Spark	Spl. & F. F.	Thermo.	Tubular	Disc	Select	3	Amidship
Sandusky	3,000	4	Block	3.7	5.0	30.0	Float Feed	Mea	Splash	Pump	Tubular	Cone	Select	3	With Motor.
Sternberg	3,000	4	Pairs	4.1	5.2	30.0	Stromberg	Eisemann	Spl. & F. F.	Pump	Tubular	Disc	Select	3	Amidship
S. & L	3,000	4	Pairs	4.2	5.0	35.0	Float Feed	Jump Spark	Spl. & F. F.	Pump		Disc	Select	3	Amidship
United States	3,000	2	Sep	5.2	4.5	22.0	Schebler	Atw't'r-Kent	Force Feed	Thermo.		Cone	I. Cl.	3	Amidship
Velie	3,000	4	Pairs	4.5	5.2	40.0	Stromberg	Splitdorf	Spl. & Pump	Thermo.	H'comb.	Disc	Select	3	Amidship
Westman††	3,000	4	Pairs	4.2	4.5	30.0	Stromberg	K-W	Spl. & F. F.	C. Pump	H'comb.	Cone	Select	3	Front Axle
Wilcox	3,000	4	Pairs	4.2	4.5	30.0	Bennett	Bosch	Splash	Pump	Tubular	Cone	Select	3	Amidship

1.5 Tons to Two Tons.

American	4,000	4	Pairs	4.8	5.5	45.0	Float Feed	Bosch	Splash	Pump	Tubular	Cone	Select	3	Amidship
Alco	4,000	4	Pairs	4.5	5.5	30.0	Float Feed	Bosch	Force Feed	Pump	Tubular	Disc	Select	3	Amidship
Atlas	4,000	4	Pairs	4.5	4.5	40.0	Float Feed	Jump Spark	With Fuel	Pump	H'comb.	Plate	Select	3	With Motor.
Atterbury	4,000	4	Block	4.2	4.5		Schebler	Bosch	Force Feed	Pump	Tubular	Plate	Select	3	With Motor.
Avery	4,000	4	Sep	4.7	5.0	45.0		Jump Spark	Spl. & F. F.	Pump	H'comb.	Disc	Select	3	Amidship
Beaver	4,000	2	Sep	5.5	5.0	28.0	Breeze	Bosch	Force Feed	Thermo.	Tubular	Plate	Select	3	Amidship
Beck	4,000	2	Sep	5.0	5.5	24.0	Float Feed	Battery	Force Feed	Pump	H'comb.		Plan	2	With Motor.
Board	4,000	4	Pairs	4.5	5.5	35.0	Float Feed	Bosch	Force Feed	Pump	H'comb.	Disc	Select	3	Amidship
Cass	4,000	4	Sep	4.2	5.0	35.0	Kingston	Bosch	Pump	Pump		Plate	Select	4	With Motor.
Chase	4,000	3‡	Sep	4.5	5.0	30.0	Holley	Bosch	With Fuel	Air		Cone	Select	3	With Jacksh.
De Dion	4,000	4	Pairs	3.0	4.7	14.0	Own	Bosch	Force Feed	Pump	Tubular	Disc	Select	3	Amidship
Durable Dayton	4,000	4	Pairs				Stromberg	Jump Spark	Pump	Pump	Tubular	Disc	Select	3	
Garford	4,000	4	Pairs	4.7	5.2	40.0	Own	Bosch	Force Feed	Pump	Tubular		Friction		Amidship
G-M-C	4,000	4	Block	4.0	6.0	25.0	Schebler	Jump Spark	Spl. & F. F.	Pump	Tubular	Disc	Select	4	With Jacksh.
Gopher	4,000	4	Pairs	4.2	4.7	38.0	Schebler	Remy	Force Feed	Pump	Tubular	Cone	Select	3	Amidship
Grabowsky	4,000	4	Pairs	4.2	4.5	28.0	Float Feed	Bosch	Spl. & F. F.	Pump	H'comb.		Select	3	With Motor.
Gramm	4,000	4	Pairs	4.2	4.5		Rayfield	Bosch	Splash	Pump	Tubular	Disc	Select	3	Amidship
Hart-Kraft	4,000	4	Block	4.2	5.2	32.0	Schebler	Optional	Spl. & Pump	C. Pump	Tubular	Disc	Select	3	Amidship
Hewitt	4,000	2	Sep	5.5	5.0	24.0	Schebler	Bosch	Splash	Thermo.	H'comb.	Cone	Plan	2	Amidship
Juno	4,000	4	Pairs	4.2	5.0	30.0	Stromberg	Eisemann	Force Feed	Pump	Tubular	Disc	Select	3	
Kelly	4,000	4	Sep	4.3	5.1	30.0	Breeze	Bosch	Spl. & F. F.	Air		Disc	Select	4	Amidship
Kissel-Kar	4,000	4		4.5	4.7	40.0	Stromberg	Bosch	Splash			Cone	Select	4	
Knox	4,000	4	Sep	5.0	4.7	40.0	Stromberg	Jump Spark	Force Feed	Pump	Tubular	Plate	Select		With Motor.
Lambert	4,000	4	Pairs				Schebler	Remy	Pumps	Pump	Vertical		Friction		
Louth-Juergens	4,000	4	Sep	4.5	5.0	35.0	Rayfield	Bosch	Spl. & F. F.	Pump	H'comb.	Disc	Select	4	With Jacksh.
McIntyre	4,000	4	Block	4.1	5.2		Float Feed	Briggs	Splash	Thermo.	H'comb.	Plate	Select	3	With Motor
Modern	4,000	4	Block	4.1	5.2	35.0	Schebler	Bosch	Spl. & F. F.	Pump	H'comb.	Disc	Select	3	With Jacksh.
Morgan	4,000	4	Block	4.2	5.1	27.0	Own	U. & H	Spl. & F. F.	Pump	H'comb.	Plate	Select	3	With Jacksh.
Packard	4,000	4	Pairs	4.1	5.1	26.0	Own	P-Eisemann	Spl. & F. F.	C. Pump	H'comb.	Plate	Prog	3	With Jacksh.
Packers	4,000	4	Pairs	4.2	4.5	30.0	Float Feed	Splitdorf	Spl. & F. F.	Pump	Tubular	Disc	Select	3	With Jacksh.
Panhard	4,000	4	Sep	3.5	5.1	18.0	Own	Magneto	Spl. & F. F.	Pump	Tubular	Disc	Prog	4	Amidship
Seitz	4,000	4	Pairs	4.5	5.0	40.0	Schebler	Remy	Spl. & F. F.	Pump			Friction		Amidship
Stegeman	4,000			4.1	5.2										
Sternberg	4,000	4	Pairs	4.2	5.0	35.0	Stromberg	Eisemann	Force Feed	Pump	Tubular	Plate	I. Cl.	3	Amidship

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Standard Gasoline Commercial Vehicles.—(Cont.)

Final Drive	TIRES Front	TIRES Rear	Front Axle	SPRINGS Front	SPRINGS Rear	Steering	BRAKES Emergency	BRAKES Service	Frame	BODY Length	BODY Width	Overall Length	Overall Width	Wheelbase	Tread	Chassis Weight.	Maximum Speed	Seat Location.	List Price.
Chs...	36x4..	36x4.5...	I-beam....	Semi-ell..	Semi-ell.	Gemmer.	Hubs..	J. S...	Pressed Steel..	100	64	175	68	110	56	3,200	20	Behind..	$2,850
Chs...	36x3.5	36x4.....	I-beam....	Semi-ell.	Semi-ell.	Gemmer.	Hubs..	J. S...	Pressed Steel..	99	66	167	71	110	56	3,100	.....	Behind..	2,100
Worm	36x5.5	36x5.5...	Tubular...	Full-ell..	Semi-ell.	Own....	Hubs..	J. S...	Wood.....	96	44	147	77	94	56.5	2,100	18	Above...	2,500
Chs...	34x3..	34x3.5...	I-beam....	Semi-ell..	Platf....	Ross...	Rever	Hubs.	Pressed Steel..	120	60	162	68	125	56	3,600	18	Above...	.....
Chs...	34x3..	36x4.....	I-beam....	Semi-ell..	Platf....	Ross...	Hubs..	.....	Rolled Steel..	96	48	179	68	126	56	4,070	15	Behind..	2,300
Chs...	34x3.5	34x4.....	I-beam....	Semi-ell..	Platf....	W. & N.	Hubs..	J. S...	Pressed Steel..	....	....	....	....	121	56	.....	15	Above...	.....
Chs...	34x3.5	34x3.5...	Square....	Semi-ell..	Semi-ell.	Screw...	Hubs..	J. S...	Channel Steel..	111	48	162	....	106	56	2,800	17	Above...	2,000
Chs...	34x3.5	36x4.....	Square....	Full-ell..	Platf....	W. & N.	J. S...	Hubs.	Wood & Steel..	86	45	174	68	118	58	3,000	18	Behind..	2,000
.....	...x3..	...x3.5...	.....	Single...	Semi-ell.	Own....	Cont..	Rever	Angle Steel....	84	48	116	65	96	56	2,100	15	Behind..	1,200
Chs...	36x3..	36x3.5...	Rect.....	I-ell.....	I-Platf..	G. & S...	Hubs..	J. S...	Wood & Steel..	108	44	172	68	115	56	2,800	18	Above...	1,750
Chs...	34x3..	34x4.....	I-beam....	Semi-ell..	Semi-ell.	Ross....	Hubs..	J. S...	Channel Steel..	116	50	195	70	120	58	2,800	15	Behind..	2,000
Shaft	37x5..	37x5.....	I-beam....	Semi-ell..	Semi-ell.	.....	.....	.....	Pressed Steel..	96	60	....	....	132	....	.....	25	.....	2,250
Chs...	36x3..	36x3.5...	I-beam....	Semi-ell..	Semi-ell.	Ross....	Hubs..	J. S...	Channel Iron...	....	....	....	....	....	56	.....	....	Behind..	.....
Chs...	32x3.5	32x3.5...	I-beam....	Semi-ell..	Semi-ell.	Ross....	J. S...	Hubs.	Angle Steel....	126	48	85	62	104	56	2,400	15	Above...	1,650
Chs...	36x2..	36x2.5...	Rect.....	I-ell.....	Full-ell..	Gemmer.	Hubs..	Hubs.	Angle Steel....	90	44	144	68	90	56	2,050	20	Above...	1,100
Chs...	34x2.5	34x2.5...	.....	.....	.....	Own....	Hubs..	J. S...	Channel Steel..	106	42	....	....	119	56	2,000	14	Behind..	1,300
Chs...	36x4..	36x2.5..D	I-beam....	Semi-ell..	Platf....	Own....	Hubs..	J. S...	Channel Steel..	96	48	189	68	122	58	3,200	25	Behind..	2,500
Ch...	34x2.5	34x3.....	Tubular...	Semi-ell..	Full-ell..	S. & N...	Hubs..	J. S...	Pressed Steel..	....	....	....	....	....	....	1,000	15	Above...	.....
Shaft	36x3..	36x3.5...	I-beam....	Semi-ell..	Full-ell..	Ross....	Hubs..	Hubs.	Pressed Steel..	86	42	....	....	100	56	2,800	15	Above...	1,750
Chs...	36x3.5	36x3.5...	Rect.....	Semi-ell..	Semi-ell.	Own....	Hubs..	Hubs.	Pressed Steel..	....	....	156	65	104	56	2,300	16	Side....	.....
Chs...	36x3.5	36x3.5...	I-beam....	Semi-ell..	Semi-ell.	Lavigne.	Hubs..	Trans.	Pressed Steel..	96	48	....	....	118	60	3,200	16	Behind..	2,300
Chs...	34x3.5	34x3.5..D	I-beam....	Semi-ell..	Semi-ell.	Foster...	Hubs.	Hubs.	Channel.....	123	66	174	72	115	56	3,400	15	Side....	1,500
Chs...	34x3..	34x3.5...	.....	Semi-ell..	Platf....	Ross....	Rever	.....	Channel.....	108	52	165	68	123	56	3,200	18	Above...	2,100
Chs...	34x2.5	34x3.....	Square....	Semi-ell..	Platf....	Warner.	J. S...	Hubs.	Pressed Steel..	84	56	134	66	96	56	.....	18	Above...	1,350
Chs...	36x3..	36x3.....	I-beam....	Semi-ell..	Platf....	B-L.....	.....	Hubs.	Steel.....	96	46	144	66	88	56	2,250	15	Above...	1,500
Chs...	36x2.5	38x2.5...	Square....	I-ell.....	Full-ell..	Ross....	.....	Exp...	Channel Steel.	92	42	144	66	96	56	2,200	20	.....	1,375
.....	38x3..	38x3.....	I-beam....	Semi-ell..	Semi-ell.	Ross....	Exp...	Exp...	Pressed Steel..	84	44	174	66	114	56	2,400	.....	Side....	1,350
Chs...	36x3.5	36x3.5...	Square....	I-ell.....	Platf....	W. & S...	Hubs.	J. S...	Pressed Steel..	....	....	....	....	120	56	2,900	18	Behind..	1,900
Shaft	34x3..	36x4.5...	Square....	Semi-ell..	Platf....	W. & W.	Hubs.	J. S...	Pressed Steel..	96	....	....	....	130	56	3,000	18	Behind..	2,250
Chs...	36x4..	48x6.....	Square....	Semi-ell..	Platf....	Own....	Hubs.	Hubs.	Steel.....	104	49	147	75	87	69	3,500	10	Above...	1,200
Chs...	40x3..	40x3.....	Square....	Semi-ell..	Platf....	Own....	Rever	Hubs.	Angle Steel....	108	60	168	66	110	56	2,700	.....	Above...	2,000
Chs...	36x3..	40x3.5...	Square....	Semi-ell..	Platf....	Ditw....	Hubs.	J. S...	Pressed Steel..	114	42	....	....	118	56	.....	.....	Side....	1,650
Chs...	34x3..	34x4.....	.....	Semi-ell..	Semi-ell.	Worm...	Hubs.	J. S...	Channel Steel..	108	44	....	....	120	56	.....	....	.....	2,100
Gear	36x4..	36x5.....	I-beam....	Semi-ell..	Semi-ell.	Warner.	Hubs.	Hubs.	Channel Iron...	108	48	168	102	105	56	3,550	20	Front...	2,000
Chs...	...x2.5	...x2.5...	I-beam....	Full-ell..	Full-ell..	Ross....	Exp...	Shaft...	Wood & Steel..	150	....	....	....	118	56	.....	....	.....	1,500
Chs...	36x3..	36x3.5...	I-beam....	Full-ell..	Platf....	Warner.	Hubs..	J. S...	Channel Steel..	112	48	204	70	117	56	3,400	16	Behind..	2,300
Chs...	34x3..	34x3.....	Square....	Semi-ell..	Platf....	Ross....	Hubs..	J. S...	Channel Steel..	120	48	168	60	107	56	.....	20	Above...	2,000

One Ton to 1.5 Tons.

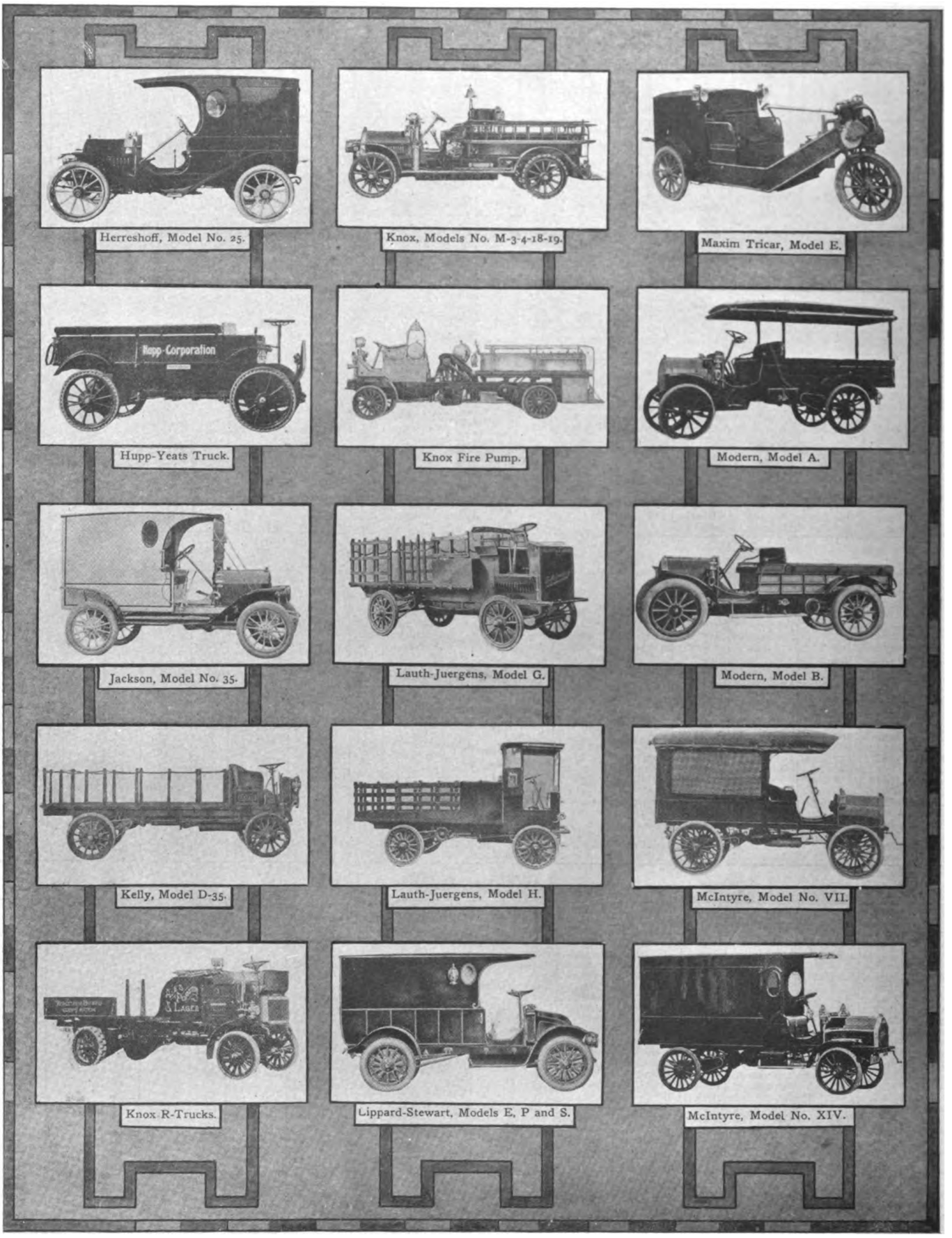
Gear..	36x3.5	36x3.5...	Tubular...	Full ell..	Full ell..	Worm...	Hubs.	Shaft...	Angle Steel..	96	48	162	60	108	56	2,600	25	Behind..	2,300
Chs...	34x3..	34x3.5...	Square....	Full ell..	Full ell..	Barnes...	.....	Hubs.	Wood & Steel..	....	....	....	....	96	56	.....	15	Above...	1,750
Chs...	36x1.7	36x1.7...	Square....	Semi-ell..	Platf....	Ross....	Hubs.	J. S...	Channel Steel..	....	....	....	....	106	56	3,000	25	Above...	.....
Chs...	34x3.5	34x4.....	Square....	Semi-ell..	Platf....	Own....	Hubs.	J. S...	Channel Steel..	108	42	189	64	115	56	.....	.....	Behind..	.....
Shaft	34x3.5	34x4.....	Tubular...	Semi-ell..	Platf....	Own....	Hubs.	Hubs.	Wood & Steel..	100	50	....	....	97	58	3,000	.....	Above...	.....
Worm	34x4..	34x3...D	I-beam....	Semi-ell..	Platf....	Gemmer.	Hubs.	J. S...	Pressed Steel..	....	....	137	70	114	60	4,000	15	Side....	3,000
Chs...	36x3..	38x3.5...	Square....	Full ell..	I-Platf..	Barnes...	Trans.	Hubs.	Steel & Wood..	94	50	180	72	112	62	.....	15	Behind..	.....
Chs...	34x3.5	34x3.5...	.....	Full ell..	I-ell.....	W. & S...	Rever	Hubs.	Wood.....	120	42	....	....	92	56	2,800	20	Above...	925
Chs...	34x3.5	34x4.....	.....	Semi-ell..	Platf....	Ross....	Hubs.	Hubs.	Pressed Steel..	144	60	....	....	129	56	3,000	20	Above...	2,500
Shaft	38x...	38x.....	Tubular...	.....	.....	Own....	Hubs.	Hubs.	Channel Steel..	....	....	....	....	84	56	3,100	15	Above...	.....
Shaft.	36x4.5	36x4.5..D	I-beam....	Semi-ell..	Semi-ell.	Own....	Hubs.	Hubs.	Pressed Steel..	112	50	206	72	120	56	3,400	25	Behind..	2,800
Chs...	36x4..	36x4.....	I-beam....	Semi-ell..	Platf....	W. & N...	Hubs.	J. S...	Pressed Steel..	....	....	....	....	121	56	.....	15	Above...	.....
Chs...	34x3.5	36x5.....	Rect.....	Semi-ell..	Semi-ell.	W. & N...	J. S...	Hubs.	Wood & Steel..	95	45	186	68	127	58	3,800	18	Behind..	2,500
Chs...	36x3.5	36x4.....	Rect.....	Semi-ell..	I-Platf..	G. & S...	Hubs.	J. S...	Pressed Steel..	120	60	186	70	124	56	3,600	15	Above...	2,200
Chs...	34x3.5	34x3.5...	.....	Semi-ell..	Semi-ell.	Own....	J. S...	Hubs.	Channel Steel..	111	48	159	67	96	56	.....	14	Above...	2,000
Chs...	34x3..	34x3.5...	I-beam....	Full-ell..	I-Platf..	Own....	Hubs.	J. S...	Channel Steel..	106	42	187	....	119	56	2,300	13	Behind..	1,600
Shaft.	36x3.5	36x3...D	Tubular...	Semi-ell..	Semi-ell.	Own....	Shaft..	Hubs.	Channel Steel..	....	....	191	66	119	56	4,500	15	Behind..	.....
Shaft.	36x...	36x.....	I-beam....	Semi-ell..	Semi-ell.	Lavigne.	Hubs.	Trans.	Pressed Steel..	....	....	....	....	133	66	.....	24	Behind..	2,200
Chs...	42x4..	44x5.....	I-beam....	Semi-ell..	I-Platf..	W. & N...	Hubs.	Hubs.	Pressed Steel..	108	60	163	71	110	58	4,200	18	Above...	.....
Chs...	40x3.5	40x3.....	Rect.....	Semi-ell..	Platf....	Ross....	Hubs.	Int....	Ch. Nick. St..	114	82	180	62	106	56	3,400	15	Above...	2,400
Chs...	34x3.5	36x4.5...	I-beam....	Semi-ell..	Semi-ell.	Ross....	Lever	Pedal	Pressed Steel..	108	60	156	72	110	56.5	3,800	18	Above...	2,300
Chs...	40x3..	40x3.5...	Square....	Semi-ell..	I-Platf..	Foster...	Hubs.	J. S...	Channel Steel..	....	....	180	....	115	58	3,000	15	Above...	2,000
Chs...	34x3..	36x3.5...	Square....	Semi-ell..	Full ell..	Ross....	Hubs.	J. S...	Channel Steel..	120	45	....	....	120	56	3,100	15	Above...	2,250
Chs...	36x3..	36x3.5..D	I-beam....	Semi-ell..	Semi-ell.	W. & S...	Hubs.	J. S...	I beam.....	144	66	....	....	148	65	5,500	15	Behind..	3,000
Shaft	36x5..	36x5.....	I-beam....	Semi-ell..	Semi-ell.	Warner.	Hubs.	Hubs.	Channel Iron...	108	48	168	68	105	56	3,550	....	Front...	2,300
Chs...	36x3.5	36x4.....	I beam....	Full-ell..	Platf....	Warner.	Hubs.	J. S...	Channel Steel..	144	66	204	70	117	58	4,600	15	Side....	2,500

1.5 Tons to Two Tons.

Chs...	36x4..	36x5.....	I-beam....	Semi-ell..	Semi-ell.	Ross....	.....	J. S...	Wood & Steel..	120	51	204	....	132	56.5	.....	15	Behind..	3,000
Chs...	36x4..	36x3....D	I-beam....	Semi-ell..	Semi-ell.	Own....	Hubs.	J. S...	Channel Steel..	....	....	177	82	112	66	4,500	18	Above...	2,750
Shaft	34x4..	34x4.....	I-beam....	Semi-ell..	Semi-ell.	Gemmer.	Trans.	.....	Channel Steel..	132	66	210	72	144	108	3,200	20	Behind..	2,800
Chs...	36x3.5	36x3.5..D	I-beam....	Semi-ell..	Semi-ell.	Own....	Hubs.	Hubs.	Pressed Steel..	120	60	....	....	144	58	3,300	16	Behind..	.....
Chs...	.....	...x3.5..D	Double....	Semi-ell..	Semi-ell.	Own....	Hubs.	J. S...	Steel Bars....	123	52	....	....	140	62	.....	20	Side....	2,500
Chs...	36x4..	36x4.5...	.....	Semi-ell..	Platf....	Own....	Hubs.	J. S...	Channel Steel..	120	66	168	68	112	58	3,800	12	Above...	2,650
Chs...	36x3.5	36x3.5..D	Square....	Platf....	Platf....	Ross....	.....	.....	.....	108	60	156	62	120	52	.....	15	Above...	1,500
Chs...	36x4..	36x3....D	I-beam....	Semi-ell..	Semi-ell.	Ross....	Hubs.	Hubs.	Channel Steel..	132	54	198	75	130	58	.....	....	Above...	.....
Chs...	34x3.5	34x3.5..D	.....	Semi-ell..	Semi-ell.	Ross....	Hubs.	J. S...	Channel Steel..	108	74	204	78	130	56	4,300	15	Behind..	2,650
Chs...	36x3.5	38x4.....	I-beam....	Full-ell..	Platf....	Barnes...	J. S...	Hubs.	Wood & Steel..	120	50	180	72	120	62	.....	12	Behind..	2,200
Sh-G..	32x4..	36x3.5...	I-beam....	Semi-ell..	Semi-ell.	Own....	Hubs.	Shaft...	Wood & Steel..	144	72	167	75	130	64	2,800	20	Above...	3,750
Shaft	36x4..	36x3....D	I-beam....	Semi-ell..	Platf....	Ross....	Hubs.	J. S...	Channel Steel..	....	....	....	....	120	65	4,700	15	Above...	2,500
Chs...	34x3.5	36x3....D	I-beam....	Semi-ell..	Platf....	Ross....	.....	Hubs.	Channel Steel..	150	60	218	68	140	56	4,650	15	Above...	.....
Chs...	34x4..	36x3.5..D	I-beam....	Semi-ell..	Semi-ell.	Ross....	Hubs.	Hubs.	Channel Steel..	144	72	243	77	142	65	5,050	13.5	Behind..	2,750
Chs...	34x4..	34x3....D	I-beam....	Semi-ell..	Semi-ell.	Ross....	Hubs.	J. S...	Channel Steel..	114	48	186	....	112	56	4,000	....	Above...	2,450
Chs...	36x4..	36x3.5..D	I-beam....	Semi-ell..	Platf....	W. & N...	Hubs.	J. S...	Pressed Steel..	....	....	....	....	121	56	.....	14	Above...	.....
Chs...	36x4..	36x3....D	Square....	Semi-ell..	Semi-ell.	Screw...	Hubs.	J. S...	Channel Steel..	132	54	180	....	117	60	3,000	16	Above...	2,600
Chs...	34x4..	36x3....D	Rect.....	Semi-ell..	Semi-ell.	W. & N...	J. S...	Hubs.	Wood & Steel..	100	45	194	68	130	58	4,200	16	Behind..	2,750
Chs...	34x4..	34x3.5..D	Square....	Semi-ell..	Semi-ell.	Own....	Hubs.	J. S...	Channel Steel..	108	48	159	78	112	60	4,200	18	Above...	2,750
Chs...	36x4..	36x3....D	Rect.....	Semi-ell..	Platf....	Ross....	Hubs.	J. S...	Channel Steel..	138	60	192	78	132	60	5,000	16	Above...	2,650
Chs...	36x4..	36x5.....	I-beam....	Semi-ell..	Platf....	Ross....	Hubs.	J. S...	Channel Steel..	168	54	....	....	136	66	4,800	15	Above...	.....
Chs...	34x4..	36x3.5..D	I-beam....	Semi-ell..	Semi-ell.	Worm...	Hubs.	J. S...	Pressed Steel..	120	60	....	....	140	60	.....	25	.....	2,750
Chs...	34x5..	34x4....D	I-beam....	Semi-ell..	Semi-ell.	Ross....	Hubs.	J. S...	Channel Steel..	120	60	....	....	103	59	4,600	15	Side....	.....
Chs...	36x3.5	36x4.....	I-beam....	Semi-ell..	Semi-ell.	Ross....	Hubs.	J. S...	Channel Steel..	....	....	....	....	....	56	2,200	18	Side....	.....
Chs...	36x4..	36x5.....	I-beam....	Semi-ell..	Semi-ell.	Ross....	J. S...	Hubs.	Channel Steel..	168	66	228	69	120	58	4,800	20	Above...	2,700
Chs...	34x4..	34x3.5..D	I-beam....	Semi-ell..	I-Platf..	Own....	Hubs.	J. S...	Channel Steel..	....	....	....	....	132	56	4,500	14	Behind..	2,500
Chs...	36x4..	36x5.....	I-beam....	Semi-ell..	Semi-ell.	Ross....	Hubs.	J. S...	Channel Steel..	132	66	198	72	118	56	4,500	15	Above...	2,600
Chs...	34x4..	35x4.....	I-beam....	Semi-ell..	Full-ell..	Own....	Hubs.	Hubs.	Channel Steel..	120	60	162	66	113	62	5,000	16	Side....	3,000
Chs...	34x3.5	34x4....D	I-beam....	Semi-ell..	Semi-ell.	Own....	Hubs.	J. S...	Channel Steel..	107	72	202	74	120	63	4,675	14	Behind..	3,000
Shaft..	36x3.5	36x5.....	I-beam....	Semi-ell..	Semi-ell.	Ross....	Hubs.	J. S...	Channel Steel..	120	54	....	....	130	60	4,300	15	Behind..	2,500
Chs...	36x4.5	36x4.5...	.....	Semi-ell..	Semi-ell.	W. & S...	Hubs.	J. S...	Wood & Steel..	144	72	....	....	120	61	3,000	30	Above...	3,600
Chs...	34x4..	34x2.5..D	I-beam....	Semi-ell..	Platf....	Own....	Rever	Hubs.	Channel Steel..	144	66	192	66	118	62	5,000	18	Above...	2,800
Chs...	34x4..	36x3....D	.....	.....	.....	W. & N...	.....	.....	Pressed Steel..	128	....	....	....	140	60	3,800	15	.....	2,950
Chs...	34x4..	36x5.....	I-beam....	Semi-ell..	Platf....	Ross....	J. S...	Hubs.	Pressed Steel..	120	60	172	72	116	56.5	4,000	15	Above...	.....

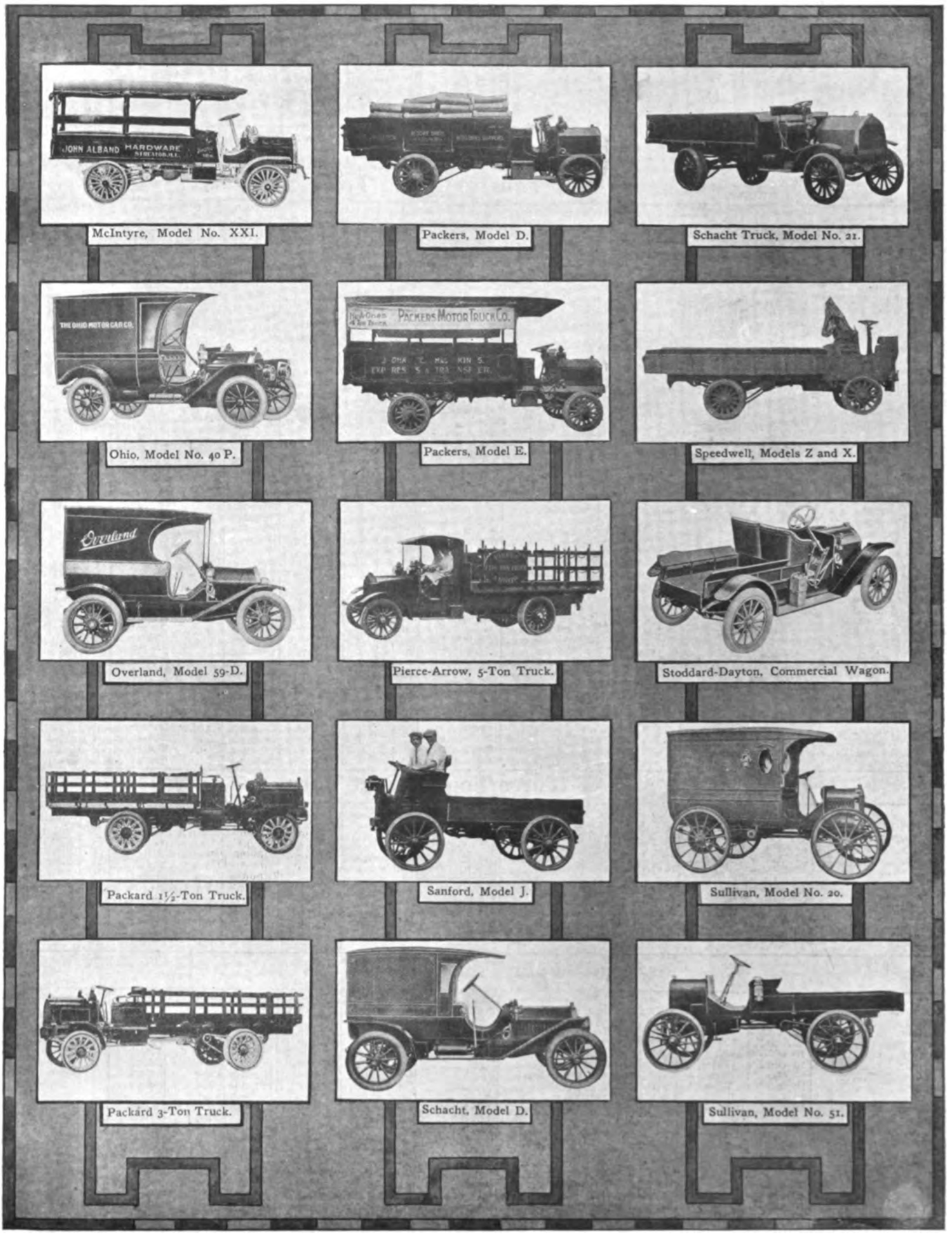
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Illustrating Standard Models for 1912—Continued.



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Illustrating Standard Models for 1912—Continued.



McIntyre, Model No. XXI.

Packers, Model D.

Schacht Truck, Model No. 21.

Ohio, Model No. 40 P.

Packers, Model E.

Speedwell, Models Z and X.

Overland, Model 59-D.

Pierce-Arrow, 5-Ton Truck.

Stoddard-Dayton, Commercial Wagon.

Packard 1½-Ton Truck.

Sanford, Model J.

Sullivan, Model No. 20.

Packard 3-Ton Truck.

Schacht, Model D.

Sullivan, Model No. 51.

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Tabulated Detailed Specifications of 1912

MAKE	Load Capacity.	POWER PLANT: Cylinders.	How Cast	Bore	Stroke	Power	Carburetion	Ignition	Lubrication	COOLING: Circulation	Radiator	Clutch	TRANSMISSION: Form	Speeds	Location
S. & S	4,000	4	Sep	4.7	5.0	36.0	Schebler	Eisemann	Spl. & F. F.	Pump	Vertical	Cone	Select	3	Amidship
Victor	4,000	4	Sep	4.1	5.2	40.0	Schebler	Bosch	Spl. & F. F.	Pump	H'comb	Opt.	Select	3	
Walter	4,000	4	Pairs	4.0	5.0	30.0	Stromberg	Bosch	Force Feed	Pump	H'comb	Cone	Select	3	With Jacksh

Two Tons to Three Tons.

Blair	5,000	4	Pairs	4.5	5.5	35.0	Schebler	Bosch	Force Feed	Pump	H'comb.	Cone	Select	3	Amidship
Hart-Kraft	5,000	4	Pairs	4.5	5.5	40.0	Schebler	Jump Spark	Spl. & F. F.	C. Pump	Tubular	Disc	Select	3	Amidship
Mais	5,000	4	Pairs	4.0	5.2	30.0	Rayfield	Eisemann	Spl. & F. F.	Thermo.	Tubular	Exp	Prog	3	With Motor
Atterbury	6,000	4	Pairs	4.7	5.5		Schebler	Bosch	Force Feed	Pump	Tubular	Disc	Select	3	Amidship
Avery	6,000	4	Sep	4.7	5.0	45.0		Jump Spark	Spl. & F. F.	Pump	H'comb.	Disc	Select	3	Amidship
Barker	6,000	4	Pairs	5.0	4.7	40.0	Mayer	Magneto	Splash	Pump	H'comb.	Disc	Select	3	With Jacksh
Blacker	6,000	4	Pairs	5.0	5.0	40.0	Float Feed	Bosch	Splash	Pump	H'comb.	Disc	Select	3	Amidship
Board	6,000	4	Pairs	5.0	5.0	45.0	Float Feed	Bosch	Force Feed	Pump	H'comb.	Disc	Select	3	Amidship
B-O-E	6,000	4	Pairs	5.0	6.5	40.0	Float Feed	Splitdorf	Spl. & F. F.	Thermo.	Tubular	Disc	Select	3	Amidship
Champion	6,000	4	Pairs	4.7	5.5	45.0	Float Feed	Optional	Force Feed	C. Pump	Tubular	Disc	Select	3	Amidship
Commer	6,000	4	Pairs	4.0	4.7	25.0	Float Feed	Bosch	Pump	Thermo.	Tubular	Cone	I. Cl	3	Amidship
Durable Dayton	6,000	4	Pairs	4.7	5.5	45.0	Stromberg	Bosch	Pump	Pump	Tubular	Disc	Select	3	
Frontenac	6,000	4	Pairs	5.0	5.7	50.0	Stromberg	Magneto	Spl. & F. F.	C. Pump	Tubular	Cone	Select	3	Amidship
Garford	6,000	4	Block	4.2	5.2	30.0	Own	Bosch	Force Feed	Pump	Vertical	Cone	Select	3	Amidship
Grabowsky	6,000	4	Pairs	5.0	5.0	40.0	Float Feed	Bosch	Spl. & F. F.	Pump	H'comb.		Select	3	With Motor
Gramm	6,000	4	Pairs	5.0	5.0	40.0	Rayfield	Jump Spark	Spl. & F. F.	Pump	Tubular	Disc	Select	4	Amidship
Hart-Kraft	6,000	4	Pairs	4.5	5.5	45.0	Schebler	Jump Spark	Force Feed	C. Pump	Tubular	Disc	Select	3	Amidship
Hewitt	6,000	2	Sep	5.5	5.0	24.0	Schebler	Bosch	Splash	Thermo	H'comb	Cone	Plan	2	Amidship
Johnson	6,000	4	Pairs	4.5	5.2	40.0	Stromberg	Optional	Splash	Pump	H'comb.	Cone	Select	3	Amidship
Jonz	6,000	4	Pairs	4.5	5.5	32.0	Schebler	Bosch	Splash	Pump	H'comb.	Plate	Select	3	With Motor
Juno	6,000	4	Pairs	4.7	5.5	45.0	Float Feed	Eisemann	Force Feed	Pump	Tubular	Disc	Select	3	With Motor
Kato**	6,000	4	Pairs	4.7	5.0	36.0	Schebler	Remy	Force Feed	Pump	Tubular	Cone	Select	3	Amidship
Kelly	6,000	4	Sep	4.3	5.1	30.0	Breeze	Bosch	Spl. & F. F.	Air		Disc	Select	4	Amidship
Kissel-Kar	6,000	4	Pairs	4.7	5.0	50.0	Stromberg	Optional	Splash	C. Pump	H'comb.	Cone	Select	4	Amidship
Knox	6,000	4	Sep	5.0	4.7	40.0	Stromberg	Bosch	Force Feed	C. Pump	Tubular	Plate	Select	3	With Jacksh
Kopp	6,000	4	Pairs	4.7	5.5	50.0	Float Feed	Bosch	Spl. & F. F.	Pump	H'comb.	Opt	Select	3	Amidship
Lambert	6,000	4				50.0	Schebler	Remy	Pump	Pump	Vertical		Friction		
Lauth-Juergens	6,000	4	Sep	4.7	5.0	45.0	Rayfield	Optional	Spl. & F. F.	Pump	H'comb.	Disc	Select	4	With Jacksh
Lord Baltimore	6,000	4	Pairs	4.1	5.2	32.0		Bosch	Force Feed	Pump	Tubular	Cone	Select	3	With Jacksh
McIntyre	6,000	4	Block	4.1	5.2	40.0	Float Feed	Briggs	Splash	Thermo.	Tubular		Select	3	With Motor
Mack	6,000	4	Pairs	5.5	6.0	48.4	Own	Bosch	Spl. & F. F.	G. Pump	H'comb.	Cone	Select	3	With Jacksh
Moeller	6,000	4	Sep	4.5	5.0	32.3	Stromberg	Bosch	Spl. & F. F.	Pump	H'comb.	Disc	Select	3	Amidship
Morgan	6,000	4	Block	4.6	5.0	34.0	Own	U. & H.	Spl. & F. F.	Pump	Tubular	Plate	Select	3	Amidship
Packard	6,000	4	Pairs	4.5	5.5	32.0	Own	P-Eisemann	Spl. & F. F.	C. Pump	Tubular	Plate	Prog	3	With Jacksh
Peerless	6,000	4	Pairs	4.5	6.5		Own	Bosch	Splash	Pump	Tubular	Cone	Select	4	Amidship
Philadelphia	6,000	4	Pairs	4.2	4.5	30.0	Float Feed	Bosch	Splash	Pump	H'comb.	Disc	Select	2	Amidship
Pope-Hartford	6,000	4	Pairs			40.0	Own	Bosch	Mech. Splash	C. Pump	Tubular	Cone	Select	3	
Sampson	6,000	4	Pairs	4.5	5.5	33.0	Float Feed	Magneto	Spl. & F. F.	Thermo.	Tubular	Disc	Select	3	Amidship
Schacht	6,000	4	Block	4.5	5.0	45.0	Schebler	Mea	Spl. & Pump	C. Pump	H'comb.	Cone	Select	3	Amidship
Schleicher	6,000	4	Pairs	5.0	5.5	45.0	Stromberg	Bosch	Spl. & F. F.	Pump	H'comb.	Cone	Select	4	Amidship
Seitz	6,000	4	Pairs	5.0	5.0	45.0	Schebler	Remy	Spl. & F. F.	Pump	Tubular		Friction		Amidship
Stegeman	6,000			4.1	5.0										
S. & L	6,000	4	Pairs	4.7	5.5	45.0	Float Feed	Splitdorf	Spl. & F. F.	Pump	Tubular	Disc	Select	3	Amidship
Universal	6,000	4	Pairs	4.0	5.5	30.0	Rayfield	Bosch	Splash	Pump	Tubular	Plate	Select	3	Amidship
Utility	6,000	4	Pairs	5.0	5.5	45.0	Float Feed	Splitdorf	Force Feed	Pump	Tubular		Friction	4	Amidship
Velie	6,000	4	Pairs	4.5	5.2	40.0	Stromberg	Splitdorf	Splash	Pump	H'comb.	Disc	Select	3	Amidship
Victor	6,000	4	Sep	4.7	5.5	50.0	Schebler	Bosch	Spl. & F. F.	Pump	H'comb.	Disc	Select	3	
Walter	6,000	4	Pairs	4.0	5.0	30.0	Stromberg	Bosch	Force Feed	C. Pump	H'comb.	Exp Cone	Select	3	With Jacksh
White	6,000	4	Block	3.7	5.1	30.0	Own	Bosch	Spl. & F. F.	G. Pump	H'comb.	Cone	Select	4	Amidship
Wilcox	6,000	4	Pairs	4.2	4.5	30.0	W-Bennett	Bosch	Splash	Pump	Tubular	Cone	Select	3	Amidship
Winkler	6,000	4	Pairs	5.0	5.0	45.0	Schebler	Splitdorf	Spl. & F. F.	G. Pump	Tubular	Disc	Select	3	Amidship

Three Tons to Four Tons.

Alco	7,000	4	Pairs	5.0	6.0	36.0	Float Feed	Bosch	Spl. & F. F.	Pump	Tubular	Disc	Select	3	Amidship
G-M-C Reliance	7,000	4	Pairs	5.5	5.5	40.0	Schebler	Mea	Splash	C. Pump	Tubular	Disc	Prog	3	With Jacksh
Knickerbocker	7,000	4	Sep	4.5	5.0	35.0	Optional	Bosch	Splash	G. Pump	H'comb.	Cone	Select	3	Amidship
Packers	7,000	4	Sep	5.2	6.0	50.0	Float Feed	Splitdorf	Spl. & F. F.	C. Pump	Tubular	Disc	Select	3	With Jacksh
Walter	7,000	4	Pairs	4.0	5.0	30.0	Stromberg	Bosch	Mechanical	C. Pump	Tubular	Exp Cone	Select	3	With Jacksh
Commer	8,000	4	Pairs	4.3	5.5	30.0	Own	Bosch	Pump	Pump	Tubular	Cone	Spl	3	Amidship
Eclipse	8,000	4		4.5	5.5	45.0	Stromberg	Bosch			Tubular	Cone	Select	3	With Jacksh
Knox	8,000	4	Sep	5.0	4.7	40.0	Stromberg	Bosch	Force Feed	C. Pump	Tubular	Plate	Select	3	With Jacksh
Peerless	8,000	4	Pairs	4.5	6.5		Own	Bosch	Splash	G. Pump	Tubular	Cone	Select	4	Amidship
Saurer	8,000	4	Pairs	4.3	5.5	30.0	Own	Eisemann	Force Feed	C. Pump	H'comb.	Cone	Select	4	Amidship
Speedwell	8,000	4	Pairs	5.0	5.0	40.0	Schebler	Eisemann	Force Feed	Pump	H'comb.	Cone	Select	3	Amidship
Stegeman	8,000		Pairs	4.5	5.5										
Sternberg	8,000	4	Pairs	5.2	8.0	50.0	Schebler	Optional	Force Feed	Thermo.	H'comb	Disc	Select	3	Amidship

Four Tons to Five Tons

Alco	10,000	4	Pairs	5.0	6.0	40.0	Newcomb	Bosch	Spl. & F. F.	C. Pump	H'comb.	Disc	Select	3	Amidship
American	10,000	4	Sep	5.2	6.0	60.0	Float Feed	Bosch	Splash	Pump		Cone	Plan	2	Amidship
Barker	10,000	4	Pairs	5.0	4.7	40.0	Mayer	Optional	Splash		H'comb	Disc	Select	3	With Jacksh
DeDion	10,000	4	Sep	4.7	5.5	35.0	Own	Bosch	Own & F. F.	Pump	Tubular	Disc	Select	3	Amidship
Gaggenau	10,000	4	Pairs	4.1	5.9	30.0	Float Feed	Bosch	Spl. & F. F.	Pump	Tubular	Disc	Select	4	Amidship
Garford	10,000	4	Block	4.2	5.2	30.0	Float Feed	Bosch	Spl. & F. F.	Pump	Tubular	Cone	Select	4	Amidship
G-M-C	10,000	4	Pairs	5.0	5.0	40.0	Schebler	Mea	Splash	C. Pump	Tubular	Disc	Prog	3	With Jacksh
Grabowsky	10,000	4	Pairs	5.2	5.7	44.1	Float Feed	Bosch	Spl. & F. F.	Pump	H'comb	Disc	Select	3	With Motor
Gramm	10,000	4	Pairs	5.0	5.0		Rayfield	Optional	Spl. & F. F.	Pump	Tubular	Disc	Select	4	Amidship
Hewitt	10,000	4	Pairs	4.2	6.0	40.0	Own	Bosch	Splash	Pump	H'comb.	Cone	Plan	2	Amidship
Johnson	10,000	4	Pairs	5.0	5.5	50.0	Stromberg	Optional	Splash	Pump	H'comb	Cone	Select	3	Amidship
Kissel-Kar	10,000	4		4.7	5.0	50.0	Stromberg	Bosch	Splash			Cone	Select	4	With Jacksh
Knickerbocker	10,000	4	Sep	4.7	5.2	40.0	Optional	Bosch	Splash	Pump	H'comb	Cone	Select	3	Amidship
Knox	10,000	4	Sep	5.5	5.5	48.0	Stromberg	Bosch	Force Feed	C. Pump	Tubular	Plate	Select	3	With Jacksh
Kopp	10,000	4	Sep	5.2	6.0	60.0	Float Feed	Bosch	Spl. & F. F.	Pump	H'comb	Disc	Select	3	Amidship
Locomobile	10,000	4	Pairs	5.0	6.0	45.0	Own	Bosch	Splash	Pump	H'comb.	Disc	Select	4	Amidship
Lozier	10,000	4	Pairs	4.2	6.5	35.0		Bosch	Spl. & P.	Opt	Tubular	M. Disc	Select	4	Amidship
Mack	10,000	4	Pairs	5.5	6.0	48.0	Own	Bosch	Spl. & F. F.	C. Pump	H'comb.	Cone	I. Cl	3	With Jacksh
Mais	10,000	4	Pairs	4.3	6.5	38.0	Rayfield	Eisemann	Spl. & F. F.	Pump	Tubular	Exp	Prog	3	With Motor
Moeller	10,000	4	Sep	4.5	5.0	32.3	Stromberg	Bosch	Spl. & F. F.	Pump		Disc	Select	3	Amidship
Morgan	10,000	4	Block	5.0	5.0	40.0	Special	U. & H.	Spl. & F. F.	Pump	H'comb	Plate	Select	3	Amidship
Peerless	10,000	4	Pairs	4.5	6.5		Own	Bosch	Splash	G. Pump	Tubular	Cone	Select	4	Amidship
Pierce-Arrow	10,000	4	Pairs	4.8	6.0	38.0	Float Feed	Bosch	Spl. & F. F.	Pump	H'comb	Cone	Select	3	Amidship
Remington	10,000	4	Pairs	4.8	6.0	38.0	Float Feed	Optional	Force Feed	Pump	H'comb.		Hydr		Amidship
Sampson	10,000	4	Pairs	5.0	5.5	40.0	Float Feed	Magneto	Force Feed	Thermo.	Tubular	Cone	Select	4	Amidship
Schleicher	10,000	4	Pairs			40.0	Stromberg	Optional	Force Feed	C. Pump	H'comb	C. Plate	Select	4	Amidship

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Standard Gasoline Commercial Vehicles.—(Cont.)

Final Drive	TIRES Front	TIRES Rear	Front Axle	SPRINGS Front	SPRINGS Rear	Steering	BRAKES Emergency	BRAKES Service	Frame	BODY Length	BODY Width	Overall Length	Overall Width	Wheelbase	Tread	Chassis Weight.	Maximum Speed	Seat Location.	List Price
Chs...	32x4..	34x5.....	I-beam....	Semi-ell.	Platf....	Ross....	Hubs..	J. S....	Channel Steel..	....	....	....	....	125	62	3,900	12	Above	.....
Chs...	36x4..	36x3....D	I-beam....	Semi-ell.	Semi-ell.	Worm...	Hubs..	J. S....	Channel Steel..	138	51..	....	....	140	66	.....	.....	.....	2,900
Chs...	36x3..5	36x5 or 6	Square....	Semi-ell.	Platf....	.....	Hubs..	Hubs..	Channel Steel..	108	72..	....	....	124	58	3,600	18	Behind.	3,000

Two Tons to Three Tons.

Worm	36x3..5	36x4.....	I-beam....	Semi-ell.	Platf....	Gemmer	Hubs	Shaft.	Pressed Steel.	138	66	144	72	121	11	4,200	15	Side	3,250
Chs...	34x4..	38x3..5..D	Square....	Semi-ell.	Semi-ell	W & N.	J. S..	Hubs.	Wood & Steel..	120	60	216	68	140	58	4,800	15	Behind	3,000
Shaft	36x4..	36x3..5..D	Tubular..	Semi-ell.	Semi-ell	Own....	Shaft.	Shaft.	Nickel Steel...	....	....	218	66	132	56	5,400	12	Behind	.....
Chs...	36x4..	36x4.....D	I-beam	Semi-ell.	Semi-ell	Own....	Hubs	Hubs	Channel Steel.	144	72	....	....	154	70	5,600	13	Behind	.....
Chs...	..x5..	..x4....D	Double....	Semi-ell.	Dbl-ell.	Own....	Hubs.	J. S..	Steel Bars.....	148	76	....	....	140	62	.....	15	Side	3,200
Chs...	36x3..5	36x4....D	I-beam	Semi-ell	Semi-ell	Spl....	J. S..	Hubs.	Channel Steel.	168	72	74	....	150	64	5,600	14	Behind	3,200
Chs...	36x5..	36x3..5..D	I-beam	Full-ell	Platf....	Own....	Hubs	J. S..	Channel Steel.	188	....	188	....	120	60	4,600	12	Above	3,300
Chs...	36x5..	36x4....D	I-beam	Semi-ell	Semi-ell	Ross....	Hubs.	J. S..	Channel Steel.	162	60	222	77	144	62	5,375	.....	Above	.....
Chs...	36x5..	36x3..5..D	Rect.....	Semi-ell	Semi-ell	S & N..	Hubs.	J. S..	Channel Steel.	144	54	101	....	138	64	.....	12	Above	3,000
Chs...	36x4..	36x5.....	.....	Semi-ell	Platf....	Ross....	Hubs	J. S..	Channel Steel.	132	60	168	68	124	58	5,100	12	Above	3,000
Chs...	34x4..	34x4....D	Round....	Semi-ell	Semi-ell	Own....	Hubs	Shaft	Pressed Steel..	96	69	216	73	132	63	4,900	25	Behind	5,000
Shaft	36x5..	36x4....D	I-beam	Semi-ell	Platf....	Ross....	Hubs	J. S..	Channel Steel.	150	66	....	....	136	66	6,700	15	Above	3,500
Chs...	36x5..	36x4 5..D	I-beam	Semi-ell	Semi-ell	Own....	Hubs.	J. S..	Channel Steel.	146	76	205	....	123	58	6,400	18	Above	3,500
Chs...	36x5..	40x4....D	Square....	Semi-ell	Semi-ell	Own....	Hubs	J. S..	Channel Steel.	144	68	....	....	120	61	5,500	12	Above	3,400
Chs...	36x5..	40x4....D	I-beam	Semi-ell	Platf....	W & N..	Hubs	J. S..	Channel Steel.	....	....	....	....	145	66	.....	12	Above	.....
Chs...	36x5..	36x4....D	Square....	Semi-ell	Semi-ell	.....	Hubs	J. S..	Channel Steel.	150	60	205	....	124	68	5,000	14	Above	3,500
Chs...	34x5..	38x4....D	Square....	Semi-ell	Semi-ell	W & N.	J. S..	Hubs.	Channel Steel	144	60	240	72	148	65	5,000	14	Behind	3,400
Chs...	34x5..	34x4....D	Square....	Semi-ell	Semi-ell	Own....	Hubs	J. S.	Channel Steel	144	72	195	76	136	60	4,600	14	Above	3,000
Chs	36x4	36x4.....	.....	Semi-ell	Semi-ell	Own....	J. S..	Hubs	Channel Steel	129	48	172	79	108	66	4,500	12	Above	2,500
Chs...	36x4..	36x5.....	I-beam	Semi-ell	Semi-ell	Gemmer	Hubs	J. S.	Channel Steel	142	72	....	....	130	66	5,000	14	Behind	3,500
Chs...	36x5..	36x4....D	Rect.....	Semi-ell	Platf....	Ross....	Hubs	J. S.	Channel Steel	156	72	222	84	142	66	6,400	10	Above	3,250
Shafts	34x5..	34x5.....	Tubular..	Semi-ell	Platf....	Ross....	Hubs	Hubs	Channel Steel	144	72	186	76	126	56	4,500	15	Above	3,500
Chs...	36x4..	38x4....D	I-beam	Semi-ell	Platf....	Ross....	Hubs	J. S.	Channel Steel	150	54	204	....	136	66	5,200	15	Above	.....
Chs...	36x4..	36x4....D	I-beam	Semi-ell	Semi-ell	.....	Hubs	J. S.	Channel Steel	148	72	232	72	144	68	5,300	18	Behind	3,350
Chs...	36x5..	36x5....D	I-beam	Semi-ell	Semi-ell	Ross....	Hubs	J. S.	Channel Steel.	144	72	....	....	149	68	6,500	15	Above	.....
Chs...	36x5..	36x4....D	I-beam	Semi-ell	Semi-ell	W & N.	Hubs	J. S.	Channel Steel.	132	....	186	....	116	64	5,800	15	Above	.....
Chs...	36x4..	36x6.....	I-beam	Semi-ell	Semi-ell	Ross....	Hubs.	J. S.	Channel Steel.	....	....	....	....	138	56	4,000	12	Behind	3,000
Chs...	38x5..	38x4....D	I-beam	Semi-ell	Semi-ell	Ross....	J. S.	Hubs.	Channel Steel.	168	72	228	72	120	63	5,500	20	Above	3,200
Chs...	34x4..	36x4....D	.....	Semi-ell	Semi-ell	Ross....	Hubs	Hubs.	.....	150	72	....	....	114	....	5,800	12	Above	3,250
Chs...	34x4..	34x4....D	I-beam	Semi-ell	4 Platf.	Own....	Hubs	J. S.	Channel Steel	....	....	....	....	140	56	5,300	12	Behind	3,200
Chs...	36x5..	36x4....D	Square....	Semi-ell	Platf....	Own....	Hubs	J. S.	Channel Steel.	144	66	204	87	129	68	6,000	16	Behind	4,000
Chs...	36x5..	36x4....D	D. Forged.	Semi-ell	Semi-ell	Ross....	Hubs	J. S.	Channel Steel.	144	72	180	72	124	62	5,200	12	Above	3,500
Chs...	34x5..	34x4....D	I-beam	Semi-ell	Semi-ell	Ross....	Hubs	J. S.	Channel Steel	150	72	198	78	127	63	7,300	10	Side	3,500
Chs...	34x4..	36x4....D	Rect.....	Semi-ell	Semi-ell	Own....	Hubs	J. S.	Channel Steel	140	72	237	81	144	68	5,900	12	Behind	3,400
Chs...	36x4..	40x4....D	I-beam	Semi-ell	Semi-ell	Own....	Exp....	J. S.	Channel Steel	....	....	....	....	151	....	6,200	14	Behind	.....
Chs...	36x2..5	42x3.....	I-beam	Full-ell	Full-ell	.....	Hubs	Trans.	Channel Steel	96	52	....	....	110	56	.....	18	Above	3,400
Chs...	36x5..	36x4....D	I-beam	Semi-ell	Semi-ell	.....	Hubs	J.S&T	Channel Steel	144	72	188	....	126	68	.....	12	Above	3,250
Chs...	34x4..	36x4....D	I-beam	Semi-ell	Semi-ell	W & N.	Hubs	Hubs.	Pressed Steel	144	66	206	82	140	70	.....	13	Above	.....
Chs...	36x4..	36x4....D	I-beam	Semi-ell	Semi-ell	Barnes.	Trans.	Hubs.	Channel Steel.	137	66	218	81	144	64	4,600	13	Behind	2,900
Chs...	34x....	34x.....	I-beam	Semi-ell	Semi-ell	Ross....	J. S.	J. S.	Channel Steel	....	....	216	78	....	78	5,000	25	Optional	4,000
Chs...	36x5..	36x3..5..D	I-beam	Semi-ell	Platf....	Own....	Trans	Hubs.	Channel Steel.	144	72	204	72	124	62	5,500	18	Above	3,500
Chs...	36x4..	38x4....D	.....	.....	.....	W & N	.....	.....	.....	141	....	....	....	150	64	5,000	12	.....	3,500
Chs...	40x4..	40x5.....	Forged....	Semi-ell.	Platf	Foster.	Hubs.	J. S..	Channel Steel.	....	....	216	....	135	58	5,000	12	Above	3,000
Chs...	36x5..	36x4....D	I-beam	Semi-ell.	Semi-ell	Ross....	Hubs.	J. S..	Channel Steel.	148	72	192	79	132	68	5,600	12	Above	3,000
Chs...	42x5..	42x5.....	Square....	Semi-ell.	Platf....	Ross....	Rever	Hubs	Steel.....	168	72	216	....	136	60	5,800	.....	Above	2,000
Chs...	36x5..	40x5....D	I-beam	Semi-ell.	Semi-ell	Own....	Hubs.	J. S.	I-beam.....	168	72	252	90	148	67..5	6,500	12	Behind	3,500
Chs...	36x6..	36x4....D	I-beam	Semi-ell.	Semi-ell	Worm...	Hubs.	J. S.	Channel Steel.	144	72	....	....	146	66	.....	.....	.....	3,450
Chs...	36x4..	42x4.....	Forged....	Semi-ell.	Platf....	.....	Hubs	Hubs.	Channel Steel.	144	72	....	....	124	62	3,400	18	Behind	3,400
Chs...	36x5..	40x4....D	Forged....	Semi-ell.	Platf....	W & S.	J. S..	Hubs.	Channel Steel.	159	77	236	83	144	65	6,000	15	Behind	3,700
Chs...	36x4..	36x3..5..D	I-beam	Full-ell	Platf....	Warner	Hubs	J. S..	Channel Steel.	168	70	234	76	126	62	5,400	12	Side	3,000
Chs...	36x5..	36x3..5..D	Square....	Semi-ell.	Platf....	.....	Hubs	J. S.	Channel Steel.	168	72	240	72	120	60	.....	15	Above	4,000

Three Tons to Four Tons.

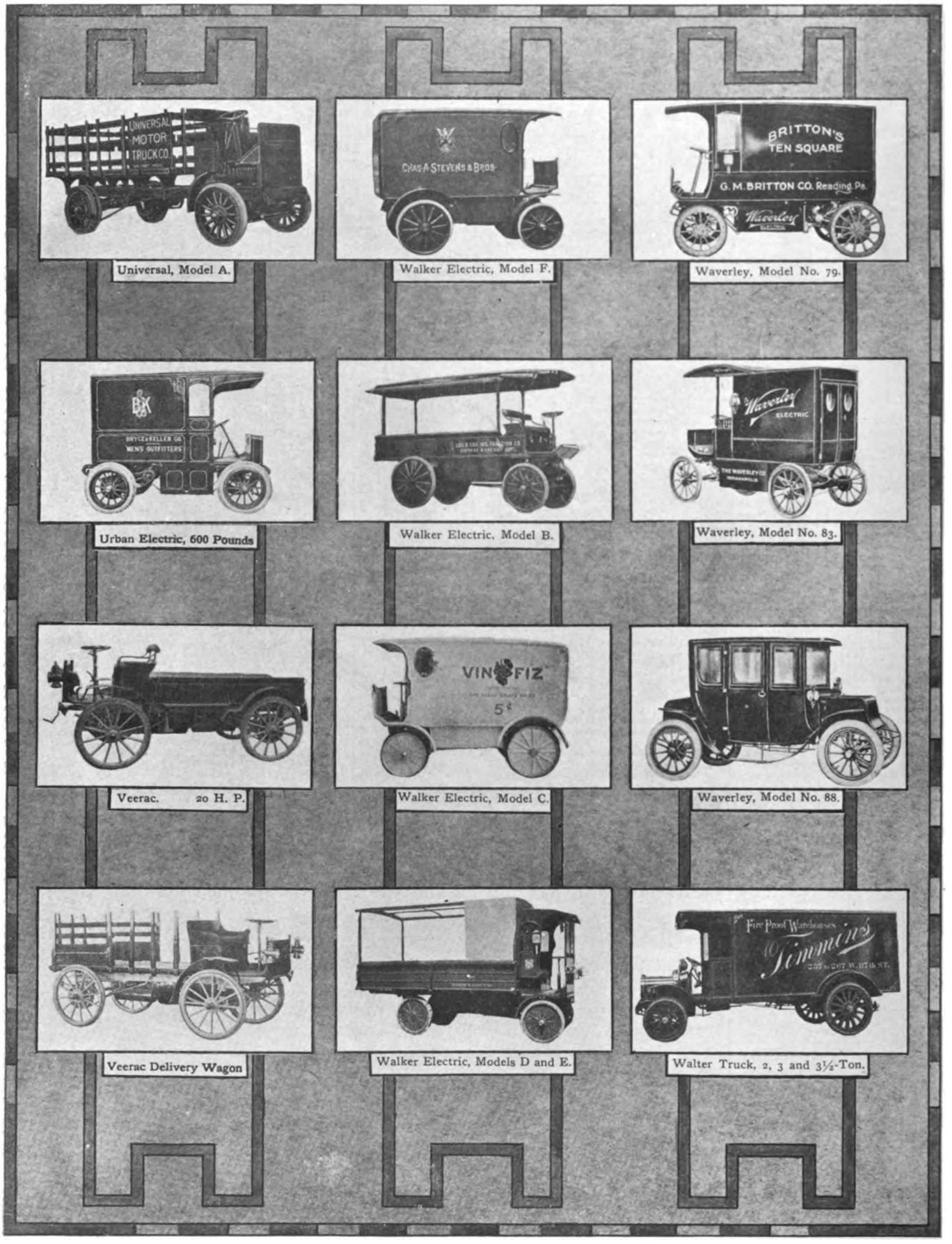
Chs...	36x5..	36x4....D	I-beam	Semi-ell.	Semi-ell.	Own....	Hubs	J. S..	Channel Steel.	....	....	211	80	126	68	5,500	12	Above	3,650
Chs...	36x5..	36x4....D	I-beam	Semi-ell.	Semi-ell.	Ross....	Hubs.	J. S..	Channel Steel.	170	64	220	84	138	65	6,500	11	Above	3,500
Chs...	36x5..	36x4....D	I-beam	Semi-ell.	Semi-ell.	Own....	Hubs.	J. S.	Channel Steel.	144	78	192	72	116	66	5,200	15	Above	3,500
Chs...	36x5..	36x5....D	I-beam	Semi-ell.	Semi-ell.	Ross....	Hubs	J. S.	Channel Steel.	....	....	....	....	150	62	6,000	13	Behind	3,400
Chs...	36x5..	42x5....D	.....	Semi-ell.	Platf....	W & G.	Hubs	Hubs.	Channel Steel.	....	....	....	....	154	62	4,400	18	Above	.....
Chs...	34x4.7	34x4.7..D	Round....	Semi-ell.	Semi-ell.	W & S.	.....	.....	Channel Steel.	144	66	240	73	132	62	5,100	20	Behind	5,500
Chs...	36x5..	36x4....D	I-beam	Semi-ell.	Platf....	Ross....	Hubs	J. S.	Channel Steel.	....	....	....	....	144	62	5,300	20	Above	.....
Chs...	36x6..	36x6....D	I-beam	Semi-ell.	Semi-ell	Ross....	Hubs.	J. S.	Channel Steel.	156	72	....	....	149	69	7,000	12	Above	4,900
Chs...	36x5..	42x5....D	I-beam	Semi-ell.	Semi-ell	Own....	Exp....	J. S.	Channel Steel.	....	....	....	....	151	....	6,900	12..3	Behind	.....
Chs...	36x5..	42x5....D	Square....	Semi-ell.	Semi-ell.	Own....	Hubs	M & JS	Channel Steel.	....	....	236	80	153	64	5,700	13	Behind	5,000
Chs...	36x5..	36x5....D	I-beam	Semi-ell.	Semi-ell.	Ross....	J. S..	Hubs	Channel Steel	150	78	224	88	115	64	5,500	12	Above	3,500
.....	36x5..	40x5....D	.....	.....	.....	.....	.....	.....	.....	147	....	....	....	155	68	6,000	10	.....	3,950
Chs...	36x...	36x.....D	I-beam	Semi-ell.	Platf....	Ross....	J. S.	Hubs.	Wood & Steel.	168	72	216	84	150	68	7,500	12	Above	3,500

Four Tons to Five Tons.

Chs...	36x6..	42x5....D	D. Forged.	Semi-ell.	Semi-ell	Own....	Hubs	J. S.	Channel Steel.	168	....	235	90	144	....	7,800	9	Above	4,750
Chs...	36x7..	36x5....D	I-beam	Semi-ell.	Platf.	Ross....	Hubs	J. S.	Wood & Steel.	155	66	....	72	130	62	.....	10	Above	4,500
Chs...	36x4..	36x4....E	I-beam	Semi-ell.	Semi-ell	Spl....	J. S.	Hubs.	Channel Steel	168	72	....	76	150	64	5,900	11	Behind	3,700
Sh G...	36x5..	38x5....D	I-beam	Semi-ell.	Semi-ell	Own....	Hubs	Shaft	Wood & Steel.	144	72	250	80	150	67	6,200	18	Behind	5,500
Chs...	33x3 9	36x4 7..D	Forged....	Semi-ell.	Semi-ell	Own....	Hubs	J. S.	Nickel Steel..	168	75	228	76	162	66	5,400	15	Behind	5,250
Chs...	36x6..	36x6....D	Square....	Semi-ell.	Semi-ell	Own....	Hubs	J. S.	Pressed Steel	144	68	....	....	....	....	6,400	10	Above	4,500
Chs...	36x6..	36x5....D	I-beam	Semi-ell.	Semi-ell	Ross....	Hubs	J. S.	Channel Steel	170	64	220	87	138	69	7,600	9..5	Above	4,400
Chs...	38x6..	40x4....D	I-beam	Semi-ell.	Platf.	W & N.	Hubs	J. S.	Channel Steel.	....	....	....	....	156	79	.....	10	Above	.....
Chs...	36x5..	40x5....D	Square....	Semi-ell.	Semi-ell	D Scr..	Hubs	J. S.	Channel Steel	156	60	205	....	130	72	7,000	12	Above	4,500
Chs...	36x4..	36x5....D	I-beam	Semi-ell.	Semi-ell	Own....	Hubs	J. S.	Pressed Steel	168	80	228	85	138	68	9,200	10	Side	5,000
Chs...	36x5..	36x3..5..D	D. Forged	Semi-ell.	Semi-ell	Own....	J. S.	Hubs	Channel Steel	153	62	204	87	132	72	6,500	10	Above	3,250
Chs...	36x5..	40x6....D	I-beam	Semi-ell.	Semi-ell	W&DN.	Hubs	J. S.	Channel Steel	168	....	....	....	156	69	6,000	.....	.....	4,350
Chs...	36x6..	36x6....D	I-beam	Semi-ell.	Semi-ell	Own....	Hubs	J. S.	Channel Steel	....	....	204	72	122	66	6,000	14	Above	4,500
Chs...	36x6..	40x6....D	I-beam	Semi-ell.	Semi-ell	Ross....	Hubs	J. S.	Channel Steel	168	72	....	....	149	73	8,000	12	Above	4,500
Chs...	36x6..	36x5....D	I-beam	Semi-ell.	Semi-ell	W & N.	Hubs	J. S.	Channel Steel	156	72	204	84	126	68	7,000	12	Above	.....
Chs...	40x6..	40x6....D	I-beam	Semi-ell.	Semi-ell.	.....	Hubs	J. S.	I-beam	....	....	....	....	140	70	.....	8..5	Above	.....
Chs...	36x5..	40x5....D	I-beam	Semi-ell.	Platf....	.....	Hubs	J. S.	Pressed Steel.	152	72	199	....	134	70	.....	13	Above	4,500
Chs	36x6..	36x5....D	Square....	Semi-ell	Platf	Own....	Hubs	J. S	Channel Steel	168	72	230	88	144	72	7,200	10	Above	4,800
Shaft.	36x	42x.....	Tubular	Semi-ell	Semi-ell	Own....	Shaft	Shaft	Channel Steel	....	....	262	....	154	66..5	.....	8	Behind	.....
Chs...	36x5..	36x5....D	D. Forged	Semi-ell	Semi-ell	Ross....	Hubs	Hubs	Channel Steel	174	72	228	72	138	65	6,650	10	Above	4,500
Chs...	36x6..	35x5....D	I-beam	Semi-ell	Semi-ell	Ross....	Hubs	J. S.	Channel Steel	168	62	222	78	144	65	7,800	10	Side	4,250
Chs...	38x6..	42x6....D	I-beam	Semi-ell	Semi-ell	Own....	Exp....	J. S.	Channel Steel	....	....	....	....	174	....	7,600	10..7	Behind	.....
Worm	36x5..	40x6....D	I-beam	Semi-ell	Semi-ell	Own....	Hubs	Trans	Pressed Steel	....	....	....	....	156	69	.....	13	Behind	4,500
Chs...	36x5..	36x5....D	I-beam	Semi-ell	Semi-ell	Own....	Hubs	Hydr.	Pressed Steel	....	....	246	69	162	61	.....	12	Above	5,000
Chs...	36x6..	36x6....D	I-beam	Semi-ell	Semi-ell	W & N.	Hubs	Shaft	Pressed Steel	168	72	242	90	155	72	8,500	10	Above	.....
Chs...	.....	.....	I-beam	Semi-ell	Full-ell	Gemmer	Hubs	J. S.	Channel Steel	....	....	....	....	156	70	.....	20	Behind	5,000

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Illustrating Standard Models for 1912—Continued.



Universal, Model A. | Walker Electric, Model F. | Waverley, Model No. 79.

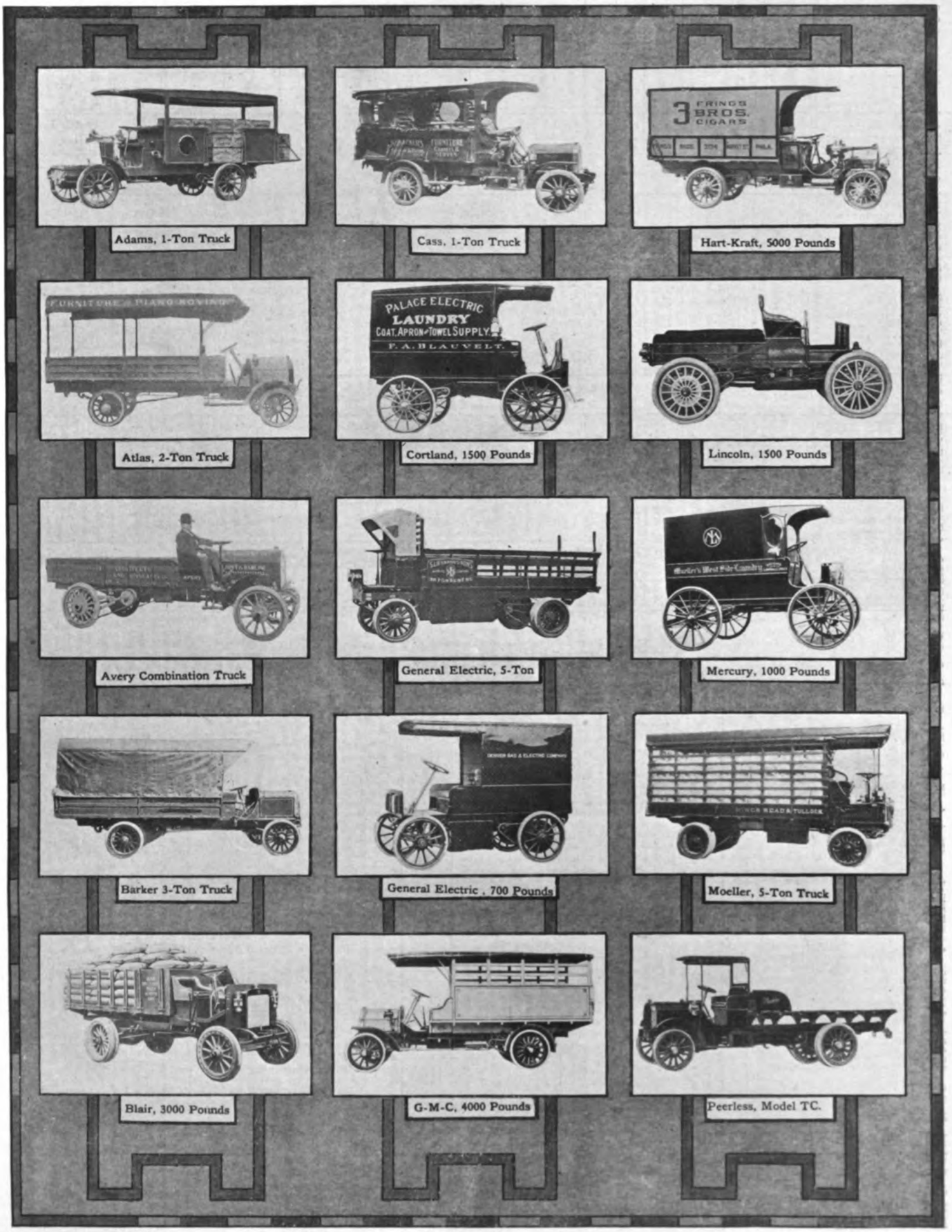
Urban Electric, 600 Pounds | Walker Electric, Model B. | Waverley, Model No. 83.

Veerac. 20 H. P. | Walker Electric, Model C. | Waverley, Model No. 88.

Veerac Delivery Wagon | Walker Electric, Models D and E. | Walter Truck, 2, 3 and 3½-Ton.

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Illustrating Standard Models for 1912—Continued.



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Tabulated Detailed Specifications of 1912

	Load Capacity.	POWER PLANT								COOLING		Clutch	TRANSMISSION		
		Cylinders.	How Cast	Bore	Stroke	Power	Carburetion	Ignition	Lubrication	Circulation	Radiator		Form	Speeds	Location
Stearns	10,000	4	Sep.	4.7	6.0	44.1	Float Feed	Bosch	Force Feed	Pump	H'comb.	Disc	Select	4	Amidship
Victor	10,000	4	Sep.	5.2	6.0	60.0	Schebler	Bosch	Spl. & F. F.	Pump	H'comb.	Disc	Select	3	
Walter	10,000	4	Pairs.	4.5	6.0	40.0	Stromberg	Bosch	Mechanical	C.Pump	H'comb.	Exp Cone	Select	3	With Jacksh.

Over Five Tons.

Commer	11,000	4	Pairs	4.7	5.5	40.0	Own	Bosch	Pump	Pump	Tubular	Cone	I. Cl.	3or4	Amidship
B-O-E	12,000	4	Pairs	5.4	8.0	44.1	Float Feed	Splitdorf	Spl. & F. F.	Thermo.	Tubular	Disc	Select	3	Amidship
Gaggenau	12,000	4	Pairs	5.3	5.9	45.0	Float Feed	Bosch	Spl. & F. F.	Pump	Tubular	Disc	Select	4	Amidship
Knox	12,000	4	Sep.	5.5	5.5	48.0	Stromberg	Bosch	Force Feed	C.Pump	Tubular	Plate	Select	3	With Jacksh.
Speedwell	12,000	4	Pairs	5.0	5.0	40.0	Schebler	Eisemann	Force Feed	Pump	H'comb.	Cone	Select	3	Amidship
Stegeman	12,000	4	Pairs	5.0	6.0	45.0	Stromberg	Briggs	Spl. & F. F.	Pump	H'comb.	Disc	Select	4	With Motor.
Alco	13,000	4	Pairs	5.0	6.0	40.0	Newcomb	Bosch	Spl. & F. F.	C.Pump	H'comb.	Disc	Select	3	Amidship
Commer	13,000	4	Pairs	4.7	5.5	40.0	Own	Bosch	Pump	Pump	Tubular	Cone	I. Cl.	3or4	Amidship
Aries	14,000	4	Pairs	5.0	5.7	40.0	G. & A.	Bosch	Pump	Pump	Tubular	Disc	Select	3	Amidship
Hewitt	14,000	4	Pairs	4.2	6.0	40.0	Own	Bosch	Splash	Pump	H'comb.	Cone	Plan	2	Amidship
Victor	14,000	4	Sep.	5.0	6.5	60.0	Schebler	Bosch	Spl. & F. F.	Pump	H'comb.	Opt.	Select	3	
Remington	15,000	4	Pairs	4.8	6.0	38.0	Float Feed	Optional	Force Feed	Pump	H'comb.		Hydr.		Amidship
Hewitt	20,000	4	Pairs	4.2	6.0	40.0	Own	Bosch	Splash	Pump	H'comb.	Cone	Plan	2	Amidship
Moore	20,000	4	Pairs	5.0	6.0	45.0	Schebler	Bosch	Spl. & F. F.	C.Pump	H'comb.	M.Disc	Select	3	Amidship
Remington	20,000	4	Pairs	4.8	6.0	38.0	Float Feed	Optional	Force Feed	Pump	H'comb.		Hydr.		Amidship
Victor	20,000	4		5.7	6.0	75.0	Schebler	Bosch	Spl. & F. F.	Pump	H'comb.	Cone	Select	3	

Municipal Wagons, Etc.

Beck 18 Passenger		4	Sep.	4.5	5.5	40.0	Schebler	Remy	Splash	Pump	Tubular	Plate	Select	3	With Motor
Franklin 5 Passenger		4	Sep	4.0	4.0	18.0	Float Feed	Bosch	Spl. & F. F.	Air		Disc	Select	3	Amidship
Great Eagle Ambulance		4	Sep.	4.7	5.0	50.0	Stromberg	Remy	G. F.	Pump	H'comb	Cone	Select	3	Amidship
Great Eagle Ambulance		6	Sep.	4.2	5.1	60.0	Stromberg	Remy	G. F.	Pump	H'comb.	Cone	Select	3	Amidship
Knox Combination Hose		6	Sep.	5.0	5.5	60.0	Stromberg	Bosch	Force Feed	C.Pump	Tubular	Plate	Select	3	With Jacksh
Knox Chemical-Hose		4	Sep.	5.5	5.5	48.0	Stromberg	Bosch	P. F. & Pump	C.Pump	Tubular	Plate	Select	3	With Jacksh
Luitwieler Pump		4	Pairs	6.0	6.5	60.0	Schebler	Dual	Force Feed			Cone	Select	3	Amidship
Victor 15 Passenger		4		4.0	4.5	30.0		Bosch	Spl. & F. F.	G.Pump	H'comb	Disc	Select	3	With Motor
Victor 20 Passenger		4	Sep	4.1	5.2	40.0		Bosch	Spl. & F. F.	G.Pump	H'comb	Disc	Select	3	
Victor 24 Passenger		4	Sep.	4.8	5.5	50.0		Bosch	Spl. & F. F.	G.Pump	H'comb	Opt.	Select	3	
Victor 30 Passenger		4	Sep	4.8	5.5	50.0		Bosch	Spl. & F. F.	G.Pump	H'comb	Opt.	Select	3	

Mixed Systems, Gasoline-Electric.

Couple-Gear	10,000	4	Sep.	5.2	6.0	45.0	Stromberg	Bosch	Spl. & F. F.	Pump	Tubular		Elec.		
Great Western	20,000	6		5.5	5.5		Stromberg			G.Pump	H'comb	25KW	Elec.		

Tabulated Detailed Specifications of 1912

MAKE.	Load Capacity.	BODY		Weight	Battery	Battery Wt.	Amp.-Hours Cap.	Motor	Motor Speed	Controller
		Length	Width							
Commercial	500									
Urban	600				30 LD 11 Pl.			GE-1,025 60 V 32 Amp.	1,200	GE-S-103
General Vehicle	700	56	40	2,700	44 GV 9 Pl.	835	104	1020 85 V 16 Amp.	1,600	S-35-B
Studebaker	800	83	36		Optional					
Ward	800				42			Spec. Auto Type		Under Front Seat
Argo	1,000	90	42	2,800	28 Ex 11 Pl.			Westinghouse		
Baker	1,000	80	40	2,200	42 Ex 9 Pl.			2.5 Horsepower Service		
Commercial	1,000									
General Vehicle	1,000	72	41	2,950	44 11 Pl.	1,255	138	1020-85 V 20 Amp.	2,000	S-35-B
Detroit	1,000	75	42	2,660	60 Edis. A-4			Type 17 70 V 30 Amp.	1,300	14T
Urban	1,000	73	42		50 Edis. A4			GE-1025 60 V 32 Amp.	1,300	GES 103
Beaver	1,500	87	40		60 Edis. A6			One GE		
Studebaker	1,500	83	39		Optional					
Argo	2,000	100	42	3,400	28 Ex 13 Pl.			Westinghouse		
Baker	2,000	90	42	3,000	42 Ex 9 Pl.			3.5 Horsepower Service		
Commercial	2,000									
Detroit	2,000	80	48	3,400	60 Edis. A6			Type 17-70 V 30 Amp.	1,300	14T
General Vehicle	2,000	96	48	4,700	44 13 Pl.	1,485	162	1026-85 V 28 Amp.	1,200	S-35-B
Lansden	2,000			3,750	Edison	1,600				
Waverley	2,000	84	40		42 Ex 11 Pl.			GE		
Studebaker	2,500	115	43		Optional					
Waverley	2,500	156	54		42 Opt 11 Pl.			2 GE		GE
Detroit	3,000	100	54	4,840	60 Edis. A8			Type 18 70 V 48 Amp.	1,120	19T
Lansden	3,000			4,250	Edison	1,600				
Walker**	3,000	96	41	4,400	42 Ex 11 Pl.		140	One 3.5 Horsepower 80 V		
Baker	4,000	150	66	4,500	42 Ex 13 Pl.			4 Horsepower Service		
Commercial	4,000	132	50	6,500	42 Ld 60 Edis.			85 V 22 Amp.		Cont. Tor.
General Vehicle	4,000	132	56	6,300	44 GV 17 Pl.	1,970	216	1026-85 V 28 Amp.	1,200	S-35-B
Lansden	4,000			4,900	Edison	1,600				
Studebaker	4,000	156	50		Optional					
Lansden	5,000			5,200	Edison	1,600				
Lansden	6,000			5,200	Edison	1,600				
Waverley	6,000	156	54		42 Opt. 15 Pl.			One GE		GE
American	7,000	156	60	7,500	42 Nat.			2 Westinghouse		
Commercial	7,000	156	58	8,500	42 Ld. 60 Edis.			85 V 16 Amp.		Cont. Tor. 4
General Vehicle	7,000	154	60	9,500	44 GV 21 Pl.	2,410	270	1,022 85 V 40 Amp.	1,200	S-35-B
Studebaker	7,000	157	56		Optional					
Commercial**	10,000	192	68	10,000	42 Ld 60 Edis.			85 V 16 Amp.		Cont. Tor.
Couple-Gear**	10,000	180	60	9,000	44 Ld 21 Pl.			One in each wheel		
General Vehicle	10,000	180	72	10,500	44 GV 25 Pl.	2,790	324	1,022 85 V 40 Amp.	1,200	S-35-B
Studebaker	10,000	169	59		Optional					

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Standard Gasoline Commercial Vehicles.—(Cont.)

Final Drive	TIRES Front	TIRES Rear	Front Axle	SPRINGS Front	SPRINGS Rear	Steering	BRAKES Emergency	BRAKES Service	Frame	BODY Length	BODY Width	Overall Length	Overall Width	Wheelbase	Tread	Chassis Weight.	Maximum Speed	Seat Location.	List Price.
Chs	34x5	38x5....D	I-beam	Semi-ell	Semi-ell	Own	Hubs	J. S.	Pressed Steel	144	72	228	84	144	63.5	.....	15	Behind	$3,800
Chs	36x6	38x5....D	I-beam	Semi-ell	Semi-ell	Worm	Hubs	J. S.	Channel Steel	144	72	....	....	146	70	.....	.....	.....	4,500
Chs	36x5	42x5....D	.....	Semi-ell	Platf	W & G	Hubs	Hubs	Channel Steel	.....	....	....	....	154	62	5,000	18	Behind	.....

Over Five Tons.

Chs	34x5 5	40x5 5..D	Round	Semi-ell	Semi-ell	Own	Hubs	J. S.	Channel Steel	150	78	264	84	144	70	6,600	15	Behind	6,500
Chs	36x6	40x6....D	Square	Semi-ell	Semi-ell	S & N	Hubs	J. S.	Channel Steel	168	60	226	84	154	68	.....	10	Side	6,000
Chs	33x4 7	37x5 5..D	N. St	Semi-ell	Semi-ell	Own	Hubs	J. S.	Ch. Nick. St.	168	75	252	76	178	66	7,600	12.5	Behind	6,000
Chs	36x7	42x7....D	I-beam	Semi-ell	Semi-ell	Ross	Hubs	J. S.	Channel Steel	168	84	....	....	149	74	8,800	11	Side	5,000
Chs	36x5 5	36x5 5..D	D. Forged	Semi-ell	Semi-ell	Ross	J. S.	Hubs	Channel Steel	186	81	260	86	139	65	5,900	9	Above	4,500
Chs	36x6	40x5 ...D	Forged	Semi-ell	Semi-ell	W & G	Hubs	Shaft	Channel Steel	150	72	....	....	156	68	5,800	10	Behind	4,000
Chs	36x7	42x6 ...D	Forged	Semi-ell	Semi-ell	Own	Hubs	J. S.	Channel Steel	168	....	235	40	164	.....	8,000	9	Above	5,200
Chs	34x5 5	40x5 5..D	Round	Semi-ell	Semi-ell	W & S	Hubs	J. S.	Channel Steel	144	72	264	84	144	70	6,800	14	Behind	6,500
Chs	36x5 5	40x8 ..St	NSt Sq	Semi-ell	Semi-ell	Own	Hubs	J. S.	Channel Steel	....	....	270	....	156	70	9,900	10	Behind	6,000
Chs	36x5 D	36x6....D	I-beam	Semi-ell	Semi-ell	Own	Hubs	J. S.	Pressed Steel	180	84	240	85	138	68	9,600	8	Side	5,500
Chs	36x7	42x6....D	I-beam	Semi-ell	Semi-ell	Worm	Hubs	J. S.	Channel Steel	144	72	....	....	146	72	.....	.....	.....	5,500
Chs	36x5	36x5....D	I-beam	Semi-ell	Semi-ell	Own	Hubs	Hydr.	Pressed Steel	....	....	246	69	162	61	.....	10	Above	5,500
Chs	36x5 D	44x7 ...D	I-beam	Semi-ell	Semi-ell	Own	Hubs	Trans	Pressed Steel	180	90	240	94	138	68	12,000	7	Side	6,000
Chs	42x6	42x6....D	I-beam	Semi-ell	Semi-ell	Ross	Hubs	J. S.	Channel Steel	192	84	246	88	135	65	10,200	12	Above	.....
Chs	36x5	36x5....D	I-beam	Semi-ell	Semi-ell	Own	Hubs	Hydr.	Pressed Steel	....	....	246	69	162	61	.....	8	Above	6,000
Chs	36x7	44x7....D	I-beam	Semi-ell	Semi-ell	Worm	Hubs	J. S.	Channel Steel	168	72	....	....	158	72	.....	.....	.....	6,500

Municipal Wagons, Etc.

Chs	36x3.5	36x4.....	Square	Semi-ell	Platf	Ross	.....	.....	Channel Steel	120	72	192	72	130	56	.....	20	Behind	3,000
Shaft	30x4	30x4.....	Tubular	Full-ell	Full-ell	Own	Hubs	Trans	Wood	....	....	....	....	122	53 .5	2,000	30	Behind	2,850
Shaft	36x4 5	36x4.5...	I-beam	.....	.....	.....	Hubs	Hubs	Pressed Steel	90	48	....	....	135	56	.....	.....	Behind	3,500
Shaft	36x4.5	36x4.5...	I-beam	.....	.....	.....	Hubs	Hubs	Pressed Steel	90	48	....	....	138	56	.....	.....	Behind	4,250
Chs	40x5	40x5....D	I-beam	Semi-ell	Semi-ell	Ross	Hubs	J. S.	Channel Steel	....	....	....	....	170	70 .7	9,000	30	Above	9,000
Chs	40x4	40x3.5..D	I-beam	Semi-ell	Semi-ell	Own	Hubs	J. S.	Channel Steel	101	50	....	....	145	60	6,000	30	Behind	5,600
Chs	x4	x5.....	D. Forged	Semi-ell	Platf	Own	.....	.....	Channel Steel	....	....	175	40	139	58	.....	42	Above	9,000
.....	34x3	34x4.....	D. Forged	Semi-ell	Semi-ell	.....	Hubs	J. S.	Channel Steel	....	....	....	....	120	56	.....	.....	.....	2,750
.....	36x4	36x3....D	I-beam	Semi-ell	Semi-ell	.....	Hubs	J. S.	Channel Steel	....	....	....	....	140	66	.....	.....	.....	3,500
.....	36x4	36x3....D	I-beam	Semi-ell	Semi-ell	.....	Hubs	J. S.	Channel Steel	....	....	....	....	140	66	.....	.....	.....	3,750
.....	36x4	36x3.5..D	I-beam	Semi-ell	Semi-ell	.....	Hubs	J. S.	Channel Steel	....	....	....	....	140	66	.....	.....	.....	4,000

Mixed Systems, Gasoline-Electric.

Elec	36x4 D	36x4....D	.....	Semi-ell	Semi-ell	Own	Elec	4 Whs	Channel Steel	168	72	222	78	144	66	9,000	12	Above	5,600
Chs	48x12	48x12....D	I-beam	Semi-ell	Semi-ell	.....	Hubs	Whs.	I-beam	208	80	302	99	172	77	14,000	6	Above	.....

Standard Electric Commercial Vehicles.

Contr. Speeds	Wheelbase	Tread	Max. Speed	Mileage	Final Drive	AXLES Front	AXLES Rear	TIRES Front	TIRES Rear	BRAKES Emergency	BRAKES Service	SPRINGS Front	SPRINGS Rear	Frame	List Price.
3 Fwd. 2 Rev.	85	.....	15	.....	Worm	.....	.....	36x2.5	36x2.5	Elec	Hubs	I-ell	Semi-ell	.....	$1,800
4 Fwd. 2 Rev.	86	56	15	50	Chs	I-beam	I-beam	34x2.5	34x2.5	2 prs.	.....	Semi-ell	Semi-ell	Spl. Des	1,800
4 Fwd. 2 Rev.	74	52	12	45	Chs	.....	.....	32x2.5	32x2.5	Exp	.....	Semi-ell	Semi-ell	Channel Steel	.....
.....	84	59	11.5	.....	Chs	.....	.....	36x2.5	42x2.5	Hubs	.....	Platf	Full-ell	.....	.....
.....	.....	.....	12	40	Chs	Tubular	Tubular	30x2	30x2	Hubs	.....	Full-ell	¾ Platf	Wood	.....
.....	86	54	12	50	Shaft	Tubular	Tubular	34x3	34x3	Exp	.....	Semi-ell	Semi-ell	Channel Steel	1,800
.....	85	56	14	.....	Chs	I-beam	Forged	34x3	34x3	Exp	.....	Semi-ell	Semi-ell	Pressed Steel	1,900
3 Fwd. 2 Rev.	90	.....	15	.....	Worm	.....	.....	36x2.5	36x3	Elec	Hubs	I-ell	Semi-ell	.....	2,000
4 Fwd. 2 Rev.	81.5	55	12	45	Chs	.....	.....	36x2.5	36x2.5	Exp	.....	Semi-ell	Semi-ell	Pressed Steel	.....
5 Fwd. 5 Rev.	80	56	14	55	Chs	I-beam	Rect	32x2.5	34x3	Hubs	J. S.	Semi-ell	Semi-ell	.....	1,300
4 Fwd. 2 Rev.	86	56	15	55	Chs	I-beam	I-beam	36x2.5	36x2.5	2 prs.	.....	Semi-ell	Semi-ell	Spl. Des	2,200
.....	91	58	12	.....	Chs	.....	.....	36x3.5	36x3.5	Hubs	J. S.	I-ell	Platf	.....	2,850
.....	91	56	12	.....	Chs	.....	.....	36x3	42x3	Hubs	.....	Platf	Platf	.....	.....
.....	96	54	12	45	Shaft	Tubular	Tubular	34x3.5	34x3.5	Exp	.....	Semi-ell	Semi-ell	Channel Steel	2,200
.....	92	56	12	.....	Chs	I-beam	Forged	34x3.5	34x3.5	Exp	.....	Semi-ell	Semi-ell	Pressed Steel	2,300
4 Fwd. 2 Rev.	100	.....	12	.....	Gear	.....	.....	36x3.5	36x4	Elec	Hubs	Semi-ell	Semi-ell	.....	2,550
5 Fwd. 5 Rev.	84	58	12	55	Chs	I-beam	Rect	32x3	34x3.5	Hubs	J. S.	Semi-ell	Semi-ell	.....	1,400
4 Fwd. 2 Rev.	102	60	10	45	Chs	Square	Round	36x3.5	36x3.5	Exp-H	.....	Semi-ell	Semi-ell	Channel Steel	.....
.....	.....	.....	10	55	Ch	.....	.....	.....	.....	Hubs	.....	Semi-ell	Semi-ell	Channel Steel	.....
.....	97.5	56	.....	.....	Chs	.....	Tubular	32x3	36x3	Hubs	J. S.	Semi-ell	Full-ell	.....	2,000
.....	104	58.5	9.2	.....	Chs	.....	.....	36x4	42x4	Hubs	.....	Semi-ell	Semi-ell	.....	.....
.....	96	68	.....	.....	Chs	.....	.....	36x3	36x3	Hubs	.....	Semi-ell	Semi-ell	.....	.....
5 Fwd. 5 Rev.	96	62	11	50	Chs	I-beam	Rect	34x3.5	36x4	Hubs	J. S.	Semi-ell	Semi-ell	Channel Steel	1,650
.....	.....	.....	9	45	Chs	.....	.....	.....	.....	Hubs	.....	Semi-ell	Semi-ell	Channel Steel	.....
.....	.....	.....	.....	.....	Gears	Tubular	Tubular	Opt	.....	Hubs	Hubs	.....	.....	.....	.....
.....	120	62	10	.....	Gears	.....	.....	36x5	36x3.5d	Hubs	.....	Semi-ell	Semi-ell	Pressed Steel	3,200
4 Fwd2 Rev.	116	.....	.....	.....	.....	.....	.....	Opt	.....	Hubs	.....	.....	.....	.....	3,000
4 Fwd. 2 Rev.	.....	.....	9	45	Chs	Round	Round	36x4	36x2.5d	Hubs	.....	Semi-ell	Semi-ell	Channel Steel	.....
.....	.....	.....	8	40	Chs	.....	.....	Opt	.....	Hubs	.....	Semi-ell	Semi-ell	Channel Steel	.....
.....	117	62.5	9.2	.....	Chs	.....	.....	36x5	36x3.5d	Hubs	.....	Semi-ell	Semi-ell	Channel Steel	.....
.....	.....	.....	7	35	Chs	.....	.....	Opt	.....	Hubs	.....	Semi-ell	Semi-ell	Channel Steel	.....
.....	.....	.....	7	30	Chs	.....	.....	Opt	.....	Hubs	.....	Semi-ell	Semi-ell	Channel Steel	.....
.....	118	73	.....	.....	Chs	.....	.....	36x5	36x5	Hubs	.....	Semi-ell	Platf	Channel Steel	.....
.....	133	62	8	.....	Chs	.....	.....	36x5	36x4 D	Hubs	.....	Semi-ell	Platf	Wood & Steel	.....
4 Fwd. 2 Rev.	.....	.....	10	.....	Gear	.....	.....	36x3.5d	36x3.5	DElec	Hubs	Semi-ell	Semi-ell	.....	4,200
4 Fwd. 2 Rev	126	63	8	40	Chs	Round	Round	36x6	36x3.5	DHubs	.....	Semi-ell	Semi-ell	Channel Steel	.....
.....	127	75	9	.....	Chs	.....	.....	36x5	36x4 D	Hubs	.....	Semi-ell	Semi-ell	Channel Steel	.....
4 Fwd. 2 Rev.	132	.....	7	25	Gear	.....	.....	35x4 D	36x4 D	Elec	Hubs	Semi-ell	Semi-ell	.....	4,650
.....	96	72	8	.....	Gears	Trussed	Trussed	36x4 D	36x4 D	Elec	Hubs	Semi-ell	Semi-ell	I-beam	5,000
4 Fwd. 2 Rev.	139	69	7	35	Chs	Round	Round	36x7	36x5 D	Hubs	.....	Semi-ell	Semi-ell	Channel Steel	.....
.....	126	76	7.5	.....	Chs	.....	.....	36x7	36x4 D	Hubs	.....	Semi-ell	Semi-ell	Channel Steel	.....

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New Commercial Car Accessories

Patton Safety Starter Crank.

The Patton safety starter crank, being marketed by the Patton Crank Company of Chicago, is designed to eliminate any possible danger of cranking and is so constructed that the slightest kick will release its locking mechanism. The instrument is similar in appearance to the ordinary member, which is removed when the Patton is fitted, the operation involving but the drilling of a small hole and the driving of a pin. It is claimed that there is nothing to adjust, as springs, cogs, ratchets, pawls or friction clutches are not employed.

Quick Detachable Rim Remover.

A device for facilitating the removal of the locking rim used with Universal or Firestone quick detachable tires has been invented by William L. Tobey, East Boston, Mass., and the instrument is very compact and inexpensive. It consists of a flange which fits over the rim, carrying an adjustable bolt with a slotted head. The tool is inserted at the joint of the locking ring and by turning the threaded member the clincher ring is forced from position as denoted in the dotted lines of the drawing. This permits of easy removal of that member. In replacing a tire the inner tube may be inflated enough to prevent possible pinching, and the ring attached by the tool. The latter is case hardened and nickel plated, and weighs but 2.5 ounces.

Dover Gasoline Funnel.

A new gasoline funnel has been brought out by the Dover Stamping & Manufacturing Company, Cambridge, Mass., and is especially adaptable for commercial vehicles. The device is made of extra heavy galvanized steel and designed to withstand hard service. The spout is larger than the standard funnels and is seamed to the body, not soldered, this arrangement eliminating the danger of breakage. The spout and lower part of the body are beaded so that they will not become airbound in any size opening. The funnel is fitted with hoops to hold the chamois and is also equipped with fine brass gauze for filtering purposes. The device is made in two sizes, four and eight quarts, respectively.

A. C. Waterproof Spark Plug.

Moisture and water seriously interfere with the proper operation of the spark plug and to prevent the high-tension current from taking paths other than intended the Champion Ignition Company, Flint, Mich., has brought out a unique type of waterproof plug. This feature is obtained by the design of the member itself, instead of by extra fittings. A coiled wire or spring leads from the centre electrode and forms a connection with the end of the high-tension cable which fits into an opening in the porcelain hood. The latter has a horizontal projection about .75 inch long, and there is no chance for the water to short circuit the plug. The hood, which is held by a clip, is fitted with a threaded tube into which the wire is screwed tightly. A feature of the plug is that after the hood is removed there is no exposed insulation to be broken by careless handling.

Electrobola Lamp.

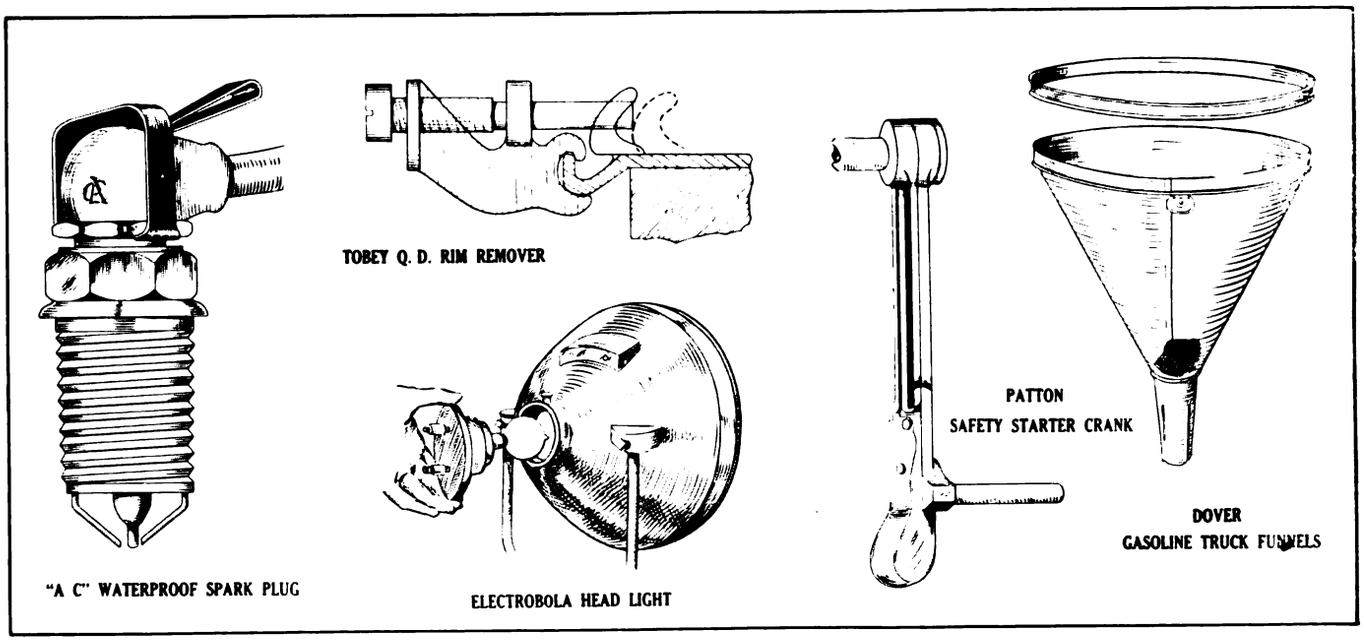
Electric lighting on the commercial vehicle presents a saving in time, which is an important factor in motor truck operation. The Electrobola Lamp Company, Milwaukee, Wis., is manufacturing a practical lamp for such service, permitting as it does the replacement of a broken bulb without unlocking the door. The bulb is fitted to a socket which is equipped with outside connections for the wires, and is locked in position by a screw. The lamp is a one-piece aluminum casting with the interior highly polished, and is claimed to be dust and moisture proof and that it will not tarnish.

ST. LOUIS IN FEBRUARY.

Although the dealers in St. Louis, Mo., already have held one display of 1912 models, this having been held in the open air last fall, plans are under way for two more in February. The second week, Feb. 12-17, will be devoted exclusively to commercial vehicles.

BIG DISPLAY FOR ATLANTA.

Not since the national show of Nov. 6-13, 1909, has Atlanta, Ga., held an automobile display. This year, the Atlanta Automobile & Accessory Association has been organized for the purpose of holding an exhibition in the Auditorium armory, Feb. 10-17. Coming so soon after the close of the Chicago show, it is anticipated that a large number of the exhibits at that display will be sent direct to Atlanta. Special provision has been made for commercial vehicles, and the present interest in this type of transport throughout the South is sufficient indication that this section will be well patronized.



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THE A B C OF MOTOR TRUCK OPERATION.

A Simple Exposition of the Principles Underlying Operation, Maintenance and Repair of All Motor Driven Commercial Cars, Outlining Details of Components. Part XV---Necessity of Speed Changing Devices and Their Forms.

By Morris A. Hall, M. E.

EVERY gasoline automobile must have a speed changing device of some form because of the principle upon which the motor operates. As previously pointed out under the heading of clutches, the internal combustion engine has a certain well defined limiting power output, which may not be exceeded or even approached without danger of stoppage. In the ordinary use of the car, running along the road where stops are necessary or in the exigencies of city traffic, this speedily is apparent. Whenever the machine is started, either from rest or from a pause or delay which has induced slower speed, it becomes necessary to lighten the load on the motor.

This may be done by slipping the clutch and speeding up the engine, then letting the former in very gently, or as is the case more often, by changing down to a lower gear so soon as the rate of crankshaft rotation must be checked. The latter method gives the engine an advantage in that the lower the speed of car through its gearing, the greater the amount of power delivered at the road wheels. Although the engine maximum output remains unchanged, these different methods of using it give the equivalent of a much greater amount of power.

To prove this by means of a practical and everyday example: Take an engine which develops 40 horsepower and is used in a car, the three forward speeds of which give respectively, 3.2, 5.3 and eight gear ratios; that is, on these various speeds, the motor will turn 3.2, 5.3 or eight times to one of the road wheels. The power exerted at the wheels varies in the exact ratio of these three figures, developing the least when the first named is in force, more with the second combination, and the most when the third or low speed mechanism is engaged. Obviously, when the load is light, the highest ratio will be utilized in order to bring forth the great speed which this also gives.

When the load is much greater as on a steep hill or through deep sand or mud, speed is undesirable but actual, certain progress is needed, hence the change is made to that relation of the gearing which produces more power at the wheels. Similarly, when the sand becomes too deep or the hill too steep for the first reduction, the third gearing is resorted to in order to bring about the maximum of which the vehicle and motor in combination are capable, although some cars are equipped with a four-speed transmission, which will give an even lower reduction.

It has been explained that starting a car throws onto the motor the biggest load of all, as by the laws of friction the greatest amount of power is required to start a body from a state of rest, having in mind that necessary for maintaining it in motion. For this reason, the truck is always expected to go away from a standstill at its slowest speed, passing to a higher rate only as it gains momentum, when less power is required to propel it and more of the available engine output can be converted into speed. This is true of all cars, regardless of size or type, but the greater the total load, the lower must be the starting speed, and the longer must the accelerating process be prolonged.

The reverse of this last statement is equally true; the lighter the whole weight carried, the more easily and quickly may the vehicle be brought up to a high rate of travel. In fact, on very light cars in the hands of expert drivers, it is not always necessary to change down to the lowest speed for starting, this being accomplished on the second or intermediate, as it is called.

However, the exigencies of starting and stopping do not constitute the sole function of the speed changing gear or transmission. There are for instance, those who do not wish to travel fast. With a car which is capable of say 50 miles an hour with the above mentioned gear ratio of 3.2 on the high, it might be that it is desired to go no faster than 30 miles an hour. In this instance it would be possible to choose between slowing the motor down until on the high gear this rate was produced, or of changing to a lower speed and letting the engine maintain its high rate of travel.

This argument might be said to refer specifically to pleasure cars, but with commercial vehicles the various speeds are even more necessary. Take a vehicle of one ton capacity designed to travel at a maximum speed of 25 miles an hour. If this were used in an emergency to carry 2800 pounds, no such speed would be expected of it. On the contrary, more power would be needed simply to keep the car in motion with the heavier load, necessitating, as previously pointed out, a lower gear reduction, or as it is commonly called, a lower gear.

In the transportation of goods, the reliability of delivery is of greater value than the actual time consumed. So, although the commercial car has a sustained speed two or three times that of the horse, certainty of arrival at its

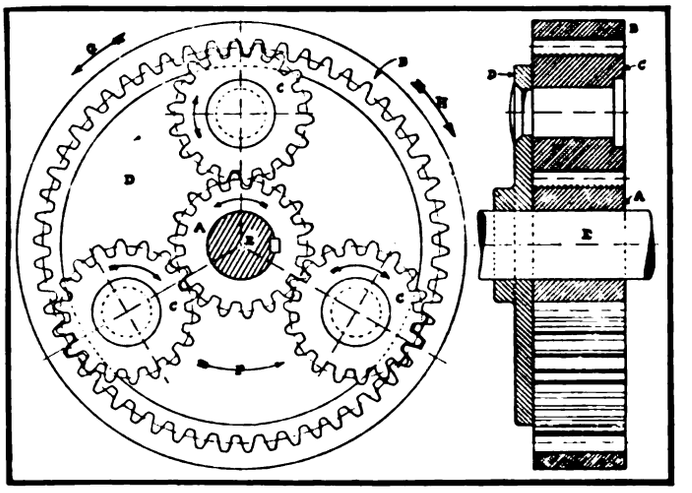


Fig. 61—Sketch to Illustrate Action of Planetary Transmission, Used on Many Low Priced Delivery Cars.

destination is of equal or greater import. Where there are hills, bad roads or pavements, ice or snow, or other possible obstructions, the vehicle must have sufficient power on the lowest gear to extricate itself. In short, this means that on a commercial car the slower speeds are of even greater value than the higher. It is for this reason that four and five-ton trucks often are found with a low speed of 3.5 and four miles an hour, when ordinary city usage would call for about twice that as a minimum; the maker cannot afford to take any chance and must gear his vehicle to a point where he and the buyer are absolutely safe.

These basic principles apply whatever the type of transmission; in fact, the latter does not enter into the discussion until later, although as will be pointed out then, the form which gives the greater number of possible speed changes would be fitted to commercial work best of all, other things being equal, for then the peculiar combination of the greatest pulling power with the highest speed can be evolved for each individual instance. However, this is a more or less ideal combination and one which is not realized in practise even by those devices designed for that specific purpose.

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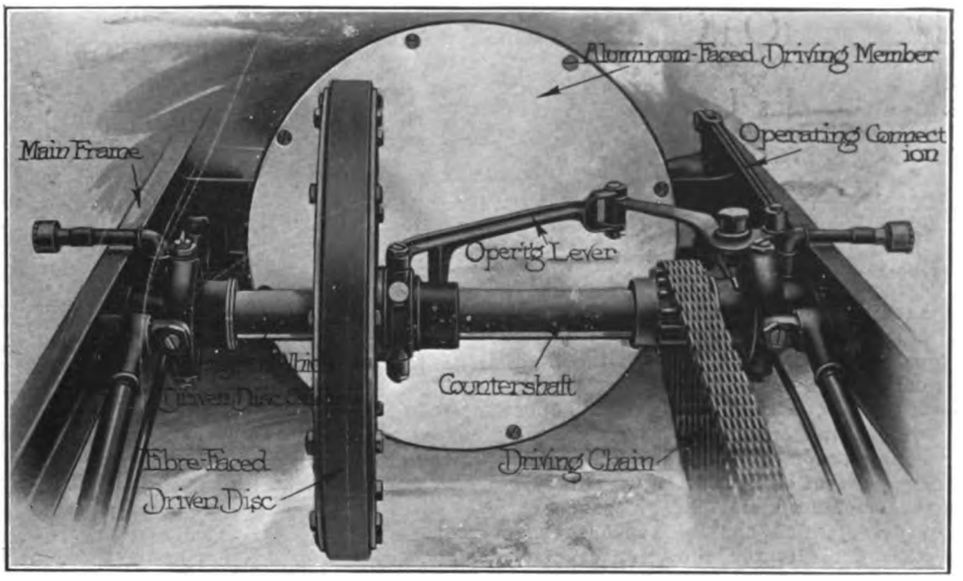


Fig. 62—Friction Form of Speed Changing Device for Commercial Cars, Showing Components and Materials Used.

Generally speaking, all forms of speed changing devices are available for commercial work, although there are inherent reasons in each one now in use which fit it best for some particular division rather than for all. There are four types of mechanism available and now used for this service: The planetary or epicyclic form of gearing; the friction transmission; the more usual sliding gearset, and the fluid devices which may be said to include as well electrical transmissions. There is a possible fifth class, in which might be placed the flat leather belt drive with a series of tight and loose pulleys and belt shifters, etc., but these may be dismissed as having gained no permanent place as yet.

The planetary transmission derives its name from the grouping of its gears in the form of a sun and planets surrounding it; in fact, the correct name for it a number of years ago was sun and planet gearing. Stated broadly, there is a central driving member, around which are grouped two, three, four or more sets of pinions, driving from it. If the two were of equal size and the planets fixed in position, there would be no difference in number of revolutions or power developed. On the other hand, when the pinions are larger than the driving gear, as is always the case, the former are rotated at a slower rate than the latter. This is when all are held in position, but when the planets are allowed to travel as a unit around the central member, a double motion is gained; one part from the drive by gear to gear, the other from the rotary movement. According to the direction and manner in which this occurs, it is either additive or subtractive. That is, when moving around in the same direction as the driving gear, a higher speed than when standing still is obtained, but if by a combination of gears and other parts, motion in the opposite direction or against the rotation of the driver be obtained this may be slower than when the planets stand still as a unit. By carrying the latter to an extreme, an entirely opposite or reverse motion may be obtained, which is the case in the usual automobile or motor truck transmission of the planetary form.

A sketch of a gear of this type is shown at Fig. 61, in which the pinion A is connected to the crankshaft of the engine or clutch shaft as the case may be, and drives the others. The three planetary gears C revolve freely on their spindles or shafts which are fixed in the plate D. The drive is taken from the latter by means of shaft, chain or otherwise. When the internally toothed ring B is held and the pinion A revolved, the planetary members are caused to run around the ring and carry the plate with them in the direction of the arrow marked F; that is, in the same direction as the driving gear. The speed, however, is altered. This is equal to the ratio of the number of teeth in the pinion to those in the ring plus one gained by the enforced left handed rotation around it. In this case, A has 18 teeth and B 54, hence the speed reduction when the latter is held is as 18 to 55 or 3.05.

If the internally toothed member B be forced to act as the driver of the set, it is apparent that the resulting direction of rotation of the gear A will be opposite to the final movement as just described or rather as indicated by the second arrow H. Moreover, so doing it will gain speed through the double motion imparted to it; one by the revolving of

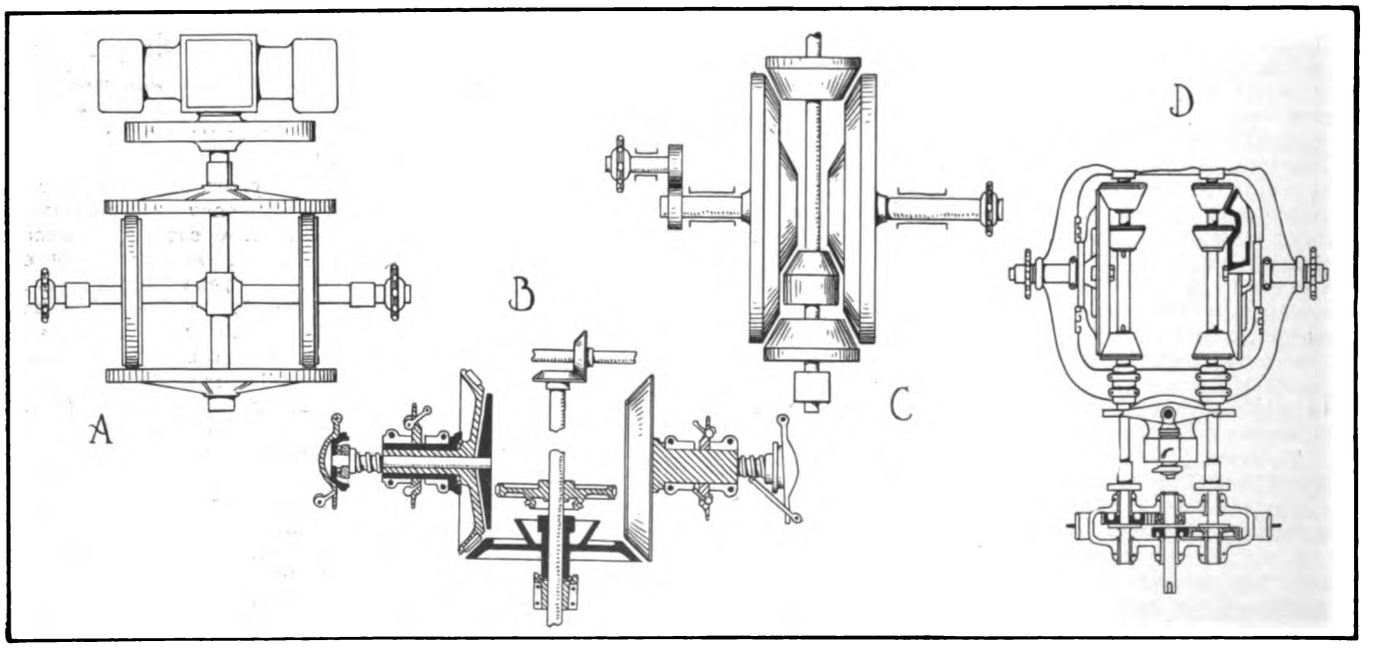


Fig. 63—Four Differing Types of Friction Transmissions, Bringing Out the Use of Spur and Bevel Discs and Combinations of These.

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the gears C, and the other by the motion of the planet as a unit represented by the plate and gears. In this case, the increase of speed would be as 54 minus one to 18, or 2.94 ratio.

In those modern gears in which the internally toothed member is used, the planets are arranged so as to have upon each spindle a second gear larger or smaller than the first and meshing with an additional central gear of corresponding size, the whole in a plane parallel to that of the set shown and the planets carried in a plate like D with an external drum on which is a band for gripping it and thus producing one speed. The internally toothed member also has a wide external face fitted with a second band, while a form of clutch is used to clamp the whole, pinion, planets and internal gear, tightly together so that they rotate as a unit without any diminution of speed. This produces the high rate, the holding of the internal gear as first described, the slow, and the gripping of the plate D carrying the planets, the low speed.

A little study will show that holding the plate D, when the pinion A drives and there is a secondary gear to take the final drive but no internal gear, is equivalent to the second case, in which above, it was supposed that the internal member was the driver and the result an increased speed. Inverting this and holding the plate will give a lower reverse speed in the ratio mentioned, 2.94. In practise, the pinions are selected so as to make a greater difference between the low and reverse speeds than this example would show.

This is the usual American form, the internal gear having been abandoned a number of years ago for several reasons. Chief among these were its first cost, which was high, with a correspondingly high replacement charge when this was broken. A point which might be mentioned before leaving the subject is that the number of pinions can be equally spaced only when this number will divide the teeth in the pinion and those in the internally toothed member exactly. In the case shown, three can be used but four could not. With the other more widely used form, the design is not subject to these limitations.

Friction transmissions produce power through the surface contact of one revolving wheel and another which it is pressed against and thus, forces to turn. Usually, the combination is such that the large flat face of the driver contacts with the narrow edge of the driven member, the position of the latter out from the centre of the former determining the speed. This is apparent when it is considered that the revolving disc has varying rates of surface travel from the centre where it is zero out to the edge which turns at the maximum rate. Obviously by placing the driven disc at either point it will be given one of these two speeds, and in the positions between, all of the possible variations.

The discs are held in contact by means of strong springs or are forced together by a mechanical device such as a toggle lever combination. Usually, the driver is movable, the ordinary clutch pedal being used to actuate this. Another pedal or lever moves the driven member across, this combination effecting the speed changes. One of these is shown in Fig. 62, which depicts the Lambert device. This is viewed from the rear or driven end and looking directly onto the driver. As marked, the latter is an aluminum faced unit, while the driven disc has a fibre friction face. The other details will be found self-explanatory.

Although this is the more usual form, it should not be thought that it is the only one. In fact, there are many different combinations, some utilizing the so-called spur wheel, others the bevel forms, and a number, both. In

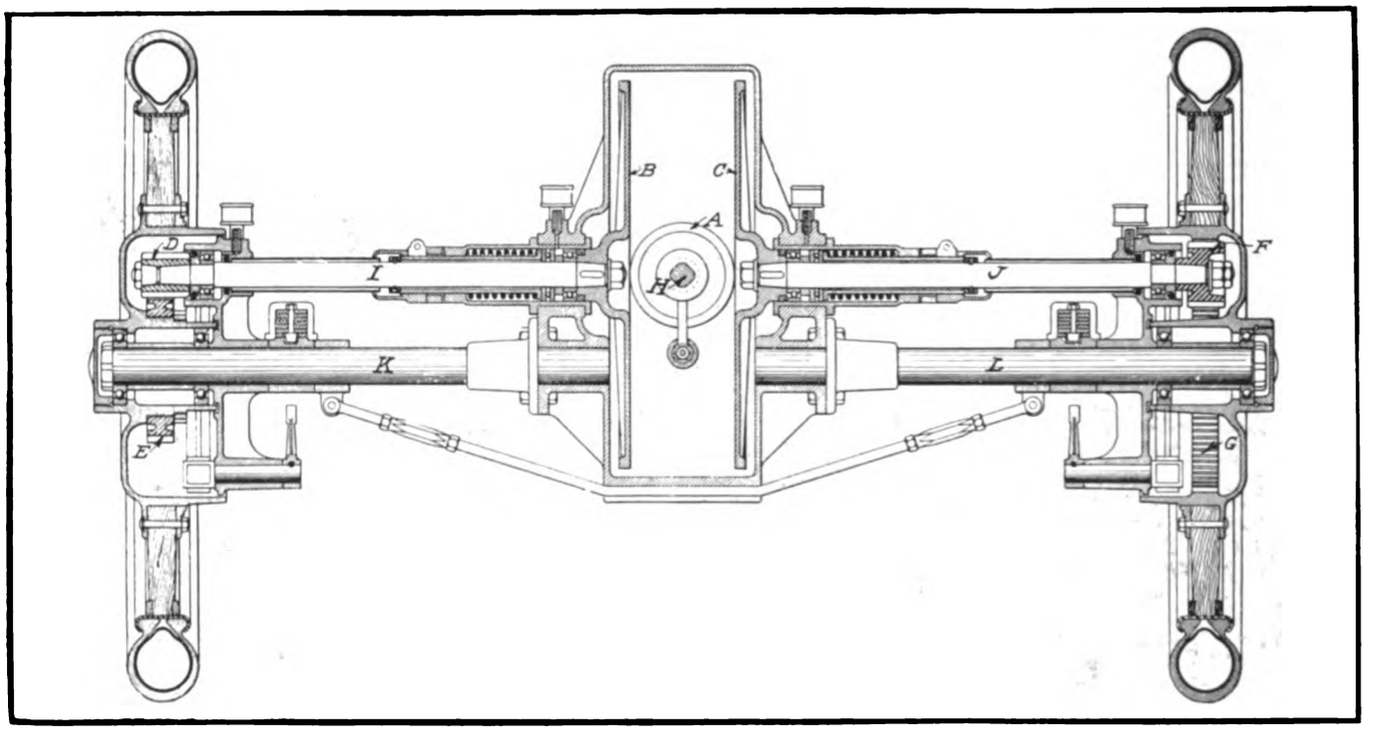


Fig. 64—Rear Axle and Friction Transmission of a Well Known Commercial Car, Showing Some of the More Important Structural Details.

Fig. 63 a group of these is shown, that at A being a four spur wheel combination. This is made in two different types, that shown being that in which each member parallel to the drive shaft contacts with but one at right angles to it, the two halves of the driven shaft being separate. The forward driver turns the right hand disc and the back member the left hand unit, both in the forward direction. In the other type, not shown, the forward disc turns both driven parts on speeds ahead and the one at the back drives them for reverse. This causes the two ends of the countershaft to turn in opposite ways, hence one of them must carry an additional spur gear arrangement to change the direction of motion so as to agree with the other.

At B is shown a combination of spur and bevel types, in which there is a direct drive on the high gear, no frictions being in contact then. The normal drive is from the engine to one bevel which propels the other two. This would give but one speed with the high making two, so the spur is introduced to produce a large number of additional variations.

The forms at C and D are of the all bevel type, a number of these being used to produce the required list of speeds in each direction. In both types, the gear reduction to

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produce both speeds in the same direction at the final points will be noted. In C this occurs back of the transmission and in D ahead of it.

Fig. 64 depicts the entire rear axle and transmission construction of a car, in which the speed changing device is of the friction type and incorporated with the final drive on the rear axle. In this, H is the driving shaft, which carries the slidable member A, contacting with both B and C. The former is fixed to the shaft I, with the gear D at its outer end. This is of the spur type and meshes with another similar member E turning on the axle K. The other disc C drives the shaft J which has the spur gear F meshing with the internal gear G, through which motion is transmitted to the half axle L. By using the spurs on one side and the internally toothed member on the other, both wheels are driven in the same direction. The springs which allow of separating B and C so as to shift A back and forth readily for speed changing will be noted.

Ed. Note—The next installment will take up the various other forms of transmissions, including the sliding gear, in both progressive and selectively operated types, etc.

MARTIN TRACTOR HAULS COAL WAGON.

After subjecting the Martin tractor, the invention of Charles H. Martin, to a series of severe tests which occupied some months, the Knox Automobile Company of Springfield, Mass., displayed the device at the New York show, where it attracted considerable attention. The tractor is so designed that it may be attached to the front axle of any horse drawn vehicle, and in the accompanying illustration is depicted the device hauling a coal wagon. When thus fitted the five-wheel combination is said to take up less room than were the animals attached.

Mr. Martin devoted considerable time to the haulage problem, and the device is the result of much study and experimenting. He claims that it will effect a great saving over the conventional motor truck design on account of its first cost being about one-half of the motor car of the same capacity, while the upkeep will be proportional. In addition, the possibilities for its use in connection with a fleet of wagons gives it a corresponding economic value.

The tractor consists of a frame supporting the power plant, and transmission machinery, which is geared to the front wheels and axle of any horse drawn vehicle. It is provided in front with a single wheel for steering, this being necessary in order to swing the frame, which corresponds to the pole of the wagon, to the right or left just as horses would. The arrangement of the wheel is such that it can be turned at an 80-degree angle, and among the advantages emphasized is that it is possible to obtain a shorter turning radius by its use.

Among other claims advanced by the designer are the following: That it eliminates many of the complications of conventional motor truck construction, while it gains in efficiency as it saves maintenance charges due to excessive vibration on stiff springs, the engine and working parts being carried on springs as resilient as those fitted to the pleasure automobile, and that it saves the cost of rubber tires since it utilizes steel members.

Among the possibilities of a motor vehicle of this type is that of serving a fleet of the horse drawn type. Assumthat a large quantity of material was to be conveyed from the base of supplies to a point several miles away, and that five double-horse teams were formerly employed in the transportation. By utilizing one tractor it could be made to serve them all by disconnecting the king bolt of one of the horse drawn wagons and raising the body when the motor propelled vehicle would be free to be attached to another body which had been similarly treated, and loaded. In this manner the automobile would be kept in constant service and considerable time saved in hauling the material.

MANY DELIVERY CARS ON COAST.

H. O. Smith, president of the Premier Motor Manufacturing Company, Indianapolis, Ind., who returned recently from a visit to the Pacific Coast, states that he was very much impressed with the large volume of business transacted with the aid of motor delivery wagons. Cars capable of carrying a load of 500 pounds to 1.5 tons are favored, and these are more extensively used than in the East.



Martin Tractor, Produced by the Knox Automobile Company, by Means of Which Horse Drawn Vehicles May Be Utilized.

GENERAL MOTORS HAS NEAT BULLETIN.

The General Motors Company, Detroit, recently mailed to its agents and customers, an unusual bulletin. It was appropriate of Christmas, depicting as it did, Santa Claus driving a G. M. C. truck loaded with toys which were tagged with names. The bulletin was printed in colors and contained a modern adaptation of "The Night Before Christmas."

LUCE CONFERS WITH COMMISSION.

Morton H. Luce, chairman of the signboard committee of the Chicago Motor Club, was in Boston recently conferring with the Massachusetts highway commissioners relative to data to assist the State of Illinois in posting road signs. Mr. Luce is manager of the Chicago branch of the Velie Motor Vehicle Company, Moline, Ill.

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FURTHER DISCUSSION OF ANTI-FRICTION BEARINGS.

Mr. Thomas Remains Unconvinced That Mr. Page Is Correct in His Position Regarding Worm Gear Mounting—Mr. Younger Gives Decisive Support to Mr. Thomas' Argument.

OPPORTUNITY was offered in the last issue of MOTOR TRUCK for H. Kerr Thomas of the Pierce-Arrow Motor Car Company, Buffalo, N. Y., and Victor W. Page of the New Departure Manufacturing Company, Bristol, Conn., to discuss their differences of opinion regarding the use of anti-friction ball bearings in connection with worm gearing. Mr. Thomas criticised certain statements made by Mr. Page in an article on this subject which appeared in the December number, and Mr. Page made extended reply thereto.

It would appear from the correspondence below, that Mr. Thomas is still far from being convinced that Mr. Page's position is correct. The controversy is made even more interesting by the appearance of a letter from John Younger, also of the Pierce-Arrow company. MOTOR TRUCK feels that its readers will be sufficiently interested in the matter to warrant presentation of both communications.

Editor, MOTOR TRUCK:

Sir:

Mr. Page's pungent criticisms of my observations on his original article compel me to ask you for further space in which to reply.

Mr. Page considers I place too much reliance on the experiments of Beauchamp Tower, showing friction decreasing with increase of power in the case of journals with oil bath lubrication, and in support of this he exhibits a table showing how that authority found the coefficient of friction rose with increased pressure in his experiments with very restricted drip feed. The two cases are entirely dissimilar since no one will attempt to run any worm gear without continuous and copious lubrication. Why then bring in the question of friction between dry surfaces? We are not discussing cone clutches, and as to uncertainty of lubrication, I will say at once that if there is any uncertainty about it such gearing will not work at all. It is usual in well designed axles to make them oil tight so that there need be no fear of any oil leakage but under no circumstances are both worm and wheel immersed in oil when stationary. Lanchester placed his original worm beneath the wheel, insuring the point of contact being covered with oil. The majority of designers have, however, the worm on the top and the teeth of the wheel form buckets which carry the oil to where it is wanted. If Mr. Page has the curiosity to open the cover of such a gear when it is running even slowly, he will see that the worm is running in a perfect oil bath and is itself almost invisible by reason of the stream of oil flowing over it.

Mr. Page makes one statement, however, which with every respect, is firstly incorrect and secondly, misleading. He says: "Lubricant cannot be introduced between bearing surfaces if the oil film pressure is greater than that of the head of the feed." Surely this is not what he means. If so, how would an ordinary line shaft bearing receive any oil from a syphon, when the bearing pressure is, say 200 pounds a square inch, and the oil is fed in under the pressure due to perhaps 1.5-inch head?

The correct answer is given in Mr. Page's own drawing (Fig. 1) where the rotary shaft is shown sweeping the oil round from the inlet to the load side, where the globules of grease spread out in a layer which causes actual separation of the two surfaces. This is even more noticeable in worm gearing where the contact is made between two convex surfaces sweeping over each other and carrying the lubricant between them.

I must plead innocent of having formulated any theory regarding friction—in the first place, I embraced Unwin's theory, and acknowledged it fully in my former letter; it is, however, a fact that a great deal of research has shown me (as indeed might have been anticipated) that it is correct. Nevertheless, some acquaintance with the elementary principles of machine construction has hitherto prevented me from attempting such an absurdity as increasing bearing pressure to eliminate friction, which is the reductio ad absurdum of Mr Page's argument in following out which he has confused the effects of friction with its coefficient in a specific case.

Mr. Page's quotations from Mr. Alford have no direct bearing on the subject as they refer to collar bearings, which I had never mentioned, as they are outside the scope of any remarks on automobile worm gearing. I have never advocated their use.

Next with regard to methods of mounting: I have nothing to add to my former remarks. I unhesitatingly say that while a worm spindle may work well with a thrust bearing at each end, it is more likely to do so if both thrusts are placed at the rear with provision to expand at the opposite end. Mr. Page's calculation shows that with 200-degree temperature rise, the worm may expand .01 inch, and as it should be mounted without any end clearance, this, if it took place, would make it dangerously tight; at the same time, I have never heard of such an extreme temperature rise taking place, and the relative expansion between worm and case is much less than the calculated figure; I agree with Mr. Page that the arrangement shown in Fig. 9 ought to be entirely satisfactory.

Next with regard to end thrust: I really must maintain that Mr. Page has seriously underestimated this and has, moreover, misunderstood my remarks. Let me endeavor to make the matter clearer.

The maximum pressure which can occur on the periphery of the worm wheel is that which will nearly cause the road wheels to skid when the car is fully loaded. This skidding may be caused by: (a) sudden application of engine power; (b) locking of brakes if fitted on the transmission shaft.

Take the case of a five-ton truck, the loaded rear axle weight will be say 16,000 pounds and the coefficient of friction between tires and road is say .625, making the resistance between road and wheel 10,000 pounds. The radius of the road wheel being say 20 inches, and that of the worm wheel say seven inches, the pressure between worm and wheel teeth will be

$$\frac{10{,}000 \times 20}{7} = 28{,}500 \text{ pounds}$$

not very far removed from what Mr. Page calls my "guess" in my last letter. Nearly all of this load has to be carried on the thrust bearing of the worm, but fortunately this force does not exist when running at a very slow speed; in fact, as stated above, just before the wheels begin to slide over the road either from the application of too much power to a stationary, or too much brake effort to a moving vehicle; consequently we do not have to provide a ball bearing 18 inches in diameter, as Mr Page naively suggests, to carry such a load at 250 revolutions a minute.

Coming to Mr. Page's last three paragraphs, I have re-read my former letter. There is nothing I said which could by any stretch of imagination be supposed to indicate a preference on my part for plain collar thrust bearings and I must directly contradict Mr. Page when he says I stated such bearings have longer life the more load one puts upon them. With the absurdity of such a statement, I cordially agree, but the statement is Mr. Page's—not mine—and having built worm driven axles for the last five years, which have been not unattended with a measure of success, I can assure Mr. Page that such experience as I have gained in that time is not the result of the "so little reflection" he supposes nor is the successful designing of worm gear to be achieved by "the little use of pencil and paper," intelligent or otherwise, or even by the reference to the few formulae and tables which appear to have led Mr. Page into paths which have not hitherto been followed by those designers of worm gearing who have been responsible for bringing it to its present state of perfection.

Yours truly,

H. KERR THOMAS, A. M. I. Mech. E., M. S. A. E.

Buffalo, N. Y., Jan. 19.

Editor, MOTOR TRUCK:

Sir:

The use of worm gearing on all kinds of horseless vehicles being an obsession with me I hasten to jump into the fray of discussion engendered between Messrs. Page and Thomas. My excuse for troubling you in the matter is that since 1905 I have been engaged with the premier firm in England designing and manufacturing worm driven trucks and pleasure cars, and feel entitled to say that I know what I am writing about.

I would have forgiven Mr. Page for his first article insomuch as he was carried away by his enthusiasm for the particular bearing in which his interests are bound up. But his onslaught on Mr. Thomas' entirely justifiable criticism places matters in another light, and I hasten to add my quota in support of Mr. Thomas.

Instead of taking some pencil and paper I would advise Mr. Page to spend a few dollars in some correspondence course and make acquaintance with some of the more elementary rules of mechanics. Newton's fundamental law states that action and reaction are equal and opposite. That is, if there is a thrust at the road contact of an automobile rear wheel, there is a corresponding but opposing thrust in the mechanism. In the case of a driving rear axle the thrust at the road contact is balanced by the thrust of the worm spindle, which in its turn is prevented from rotating the axle casing by means of a suitable torque rod.

Taking Mr. Page's figures as given in your issue of December we have

40 H. P. delivered at worm spindle at 1000 rpm of motor = Ratio of reduction.

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Reverse 32—1 giving 328 ft. per minute travelled.
Low 24—1 giving 440 ft. per minute travelled.
Second 16—1 giving 655 ft. per minute travelled.
(Assuming a wheel diameter of 40 inches.)

The next step is to state that the efficiency of the worm gearing neglecting the bearings is about 95 per cent., not 85 per cent., which is the efficiency of the whole rear axle with bearings. (I am neglecting the bearings because I am only considering the action between the forward end of the worm spindle and the rear end where the thrust is taken, and it is unnecessary to take losses into your calculation when you know they have to be eliminated afterwards.)

Therefore we have effective horsepower 38, and the sum of the two pushes at the rear wheels assuming, as will be the case, that the motor will be working to capacity, are:

$$\text{On Reverse } \frac{38 \times 33000}{328} = 3800 \text{ pounds.}$$

$$\text{Low } \frac{38 \times 33000}{440} = 2850 \text{ pounds.}$$

$$\text{Second } \frac{38 \times 33000}{655} = 1920 \text{ pounds.}$$

Now this is at 20 inches radius, and on the principle of leverage this is increased in proportion to decrease of lever; i. e., in proportion 20 to 6 (radius of worm wheels) so that these thrusts resolve themselves thus:

Reverse 3.33 × 3800 equals 12600 pounds.
Low 3.33 × 2850 equals 9500 pounds.
Second 3.33 × 1920 equals 6400 pounds.

These pressures are approximately 10 times Mr. Page's, and these are not guesses, but the result of definite, cold-blooded logic, which my years of experience has proved to be right.

The type of bearing recommended by Mr. Page is obviously unsuited for such thrusts as I have determined above unless made in sizes like 12 or 15 inches diameter. Mr. Page has to my mind attempted to use second hand experience of worm gearing on pleasure cars or possibly light trucks to design a suitable gearing for heavy trucks. There is, however, one most important and vital difference which is only run across by experience and it alters the whole complexion of the case.

Mr. Thomas' calculation of 30,000 pounds is evidently based on braking pressure under maximum conditions, and is so exceedingly close to what can be reached under certain conditions that it is no guess but a fact.

Mr. Page assumes much indignation that anyone should dare criticise him, but he has been caught napping in something more simple than mathematical abtruseness. On page 471, December issue, he states that even with the worm installed above the worm wheel it is almost impossible to obtain the desirable 12 inches ground clearance. On page 64, January, he forgets all this and states that where large traction wheels are fitted as on the motor truck, the worm can be housed very easily under the axle as the requisite ground clearance can be obtained very readily. Which statement are we to believe, as really 40-inch driving wheels are quite large sized wheels and obtaining conditions do not warrant us placing on larger?

In all my experience of worm gearing, confined almost entirely to the overhead type I have only seen two failures due to want of lubrication—one was where the oil plug at the bottom of the case was opened in some manner and the oil ran out unnoticed, the other was due to oil having been forgotten after reassembling. It is an actual fact that even in the overhead type of worm gearing, lubricant is always present between the tooth faces no matter how long the truck has been standing, provided, of course, that the case is originally filled as the makers direct and kept up to the mark afterwards.

Again, engineers are not divided evenly, as Mr Page thinks, on the position of the worm above or below. For heavy truck service they are unanimous in favor of the overhead system, as introduced by John Dennis in 1901. In light pleasure cars the overhead system decidedly preponderates, and in the other cases, I question if lubrication has had as much influence on the location as had low centre of gravity all around.

The use of worm gearing on trucks brings up some curious problems and only practical experience can determine their solution. Mr. Page should gain some of this experience under actual road conditions, and then make full use of his intelligence to deduce his theoretical basis on which to build his design.

Yours truly,
JOHN YOUNGER, B. S.
Mechanical Engineer, Commercial Vehicle Department of Pierce-Arrow Motor Car Company.
Buffalo, N. Y., Jan. 22.

IN THE MARKET FOR ONE OR TWO TRUCKS.

Editor MOTOR TRUCK:
Sir:

We would like to have it known among the manufacturers of commercial vehicles that we are figuring on the purchase of one or two motor trucks for delivering Portland cement and other materials. Nothing less than a three-ton truck would be of any service to us and we would probably prefer a five-ton truck, if it can be shown that maintenance costs are not excessive.

We wish information as to price, estimated cost of upkeep, and actual cost of upkeep, as shown by the experience of various users. The experience of building supply dealers is much more valuable to us than any other kind.

Yours very truly,
KOSMOS PORTLAND CEMENT CO., Inc.
Charles Horner, Vice President.
Louisville, Ky., Jan. 23.

CALENDAR OF COMING EVENTS.

February.

Feb. 1- 7—Show, Washington, D. C.
Feb. 3-10—National show, Montreal, Can.
Feb. 3-10—Show, Harrisburg, Penn.
Feb. 5-10—Commercial car show, Chicago, Ill.
Feb. 5-10—Commercial car show, Pittsburg, Penn.
Feb. 5-10—Pleasure car show, St. Louis, Mo.
Feb. 5-10—Show, Buffalo, N. Y.
Feb. 5-10—Show, Bangor, Me.
Feb. 10-17—Show, Atlanta, Ga.
Feb. 12-17—Commercial car show, St. Louis, Mo.
Feb. 12-17—Show, Memphis, Tenn.
Feb. 12-17—Show, Ottawa, Can.
Feb. 12-17—Show, Fall River, Mass.
Feb. 12-17—Show, Kansas City, Mo.
Feb. 12-19—Show, Dayton, O.
Feb. 14-17—Show, Grand Rapids, Mich.
Feb. 17-24—Exposition show, Pittsburg, Penn.
Feb. 17-24—Association show, Minneapolis, Minn.
Feb. 17-24—Show, Newark, N. J.
Feb. 17-24—Show, Cleveland, O.
Feb. 19-24—Show, Omaha, Neb.
Feb. 19-24—Show, Hartford, Conn.
Feb. 19-24—Show, Cincinnati, O.
Feb. 19-24—Show, Portland, Me.
Feb. 20-24—Show, Binghamton, N. Y.
Feb. 20-25—Show, New Orleans, La.
Feb. 20-28—Show, Baltimore, Md.
Feb. 21-23—Show, Keene, N. H.
Feb. 21-24—Show, Louisville, Ky.
Feb. 21-28—Show, Toronto, Can.
Feb. 24-March 2—Show, Brooklyn, N. Y.
Feb. 26-March 2—Show, Paterson, N. J.
Feb. 26-March 2—Show, Elmira, N. Y.
Feb. 28-March 2—Show, Davenport, Ia.

March.

March 2-9 —Show, Norfolk, Va.
March 2-9 —Pleasure car show, Boston, Mass.
March 4-9 —Show, Des Moines, Ia.
March 4-10—Show, Denver, Col.
March 6-9 —Show, Tiffin, O.
March 11-16—Show, Cedar Rapids, Ia.
March 12-16—Show, Syracuse, N. Y.
March 13-20—Commercial car show, Boston, Mass.

PROMPT SERVICE WITH MOTOR CARS.

Efficient service and promptness in the delivery of merchandise are features of the automobile appreciated by both the business man and the purchaser. There is, perhaps, no industry where promptness is more desirable at times than in the coal industry. Many times the fuel is delayed in reaching its destination when hauled by the horse drawn equipment, especially when the weather conditions are unfavorable for the animal.

The motor truck eliminates tardy deliveries, is not affected by heat or cold, and is cheaper a ton-mile than any other form of transportation. The practicability of the motor car was demonstrated in New York City recently when one of the large hotels sent in a hurry order to H. L. Herbert & Co., which concern maintains a fleet of Commer cars. Three machines were placed in service, hauling the fuel to the hotel on Sunday morning and at night 240 tons had been delivered. The three cars made 33 trips and one delivered 94.5 tons. These same vehicles, during the first 19 days of December, hauled 2700 tons, including short and long hauls and during a period of heavy snowfall when the concerns utilizing animals were unable to make deliveries on time.

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FOX PUBLIC SERVICE MOTOR CAB DESIGN.

Vehicle Having All Desirable Passenger Requirements, Adequate Power and Speed, Designed with Proven Mechanical Construction to Secure Extreme Economy of Operation, Maintenance and Upkeep—Simplicity and Accessibility the Features.

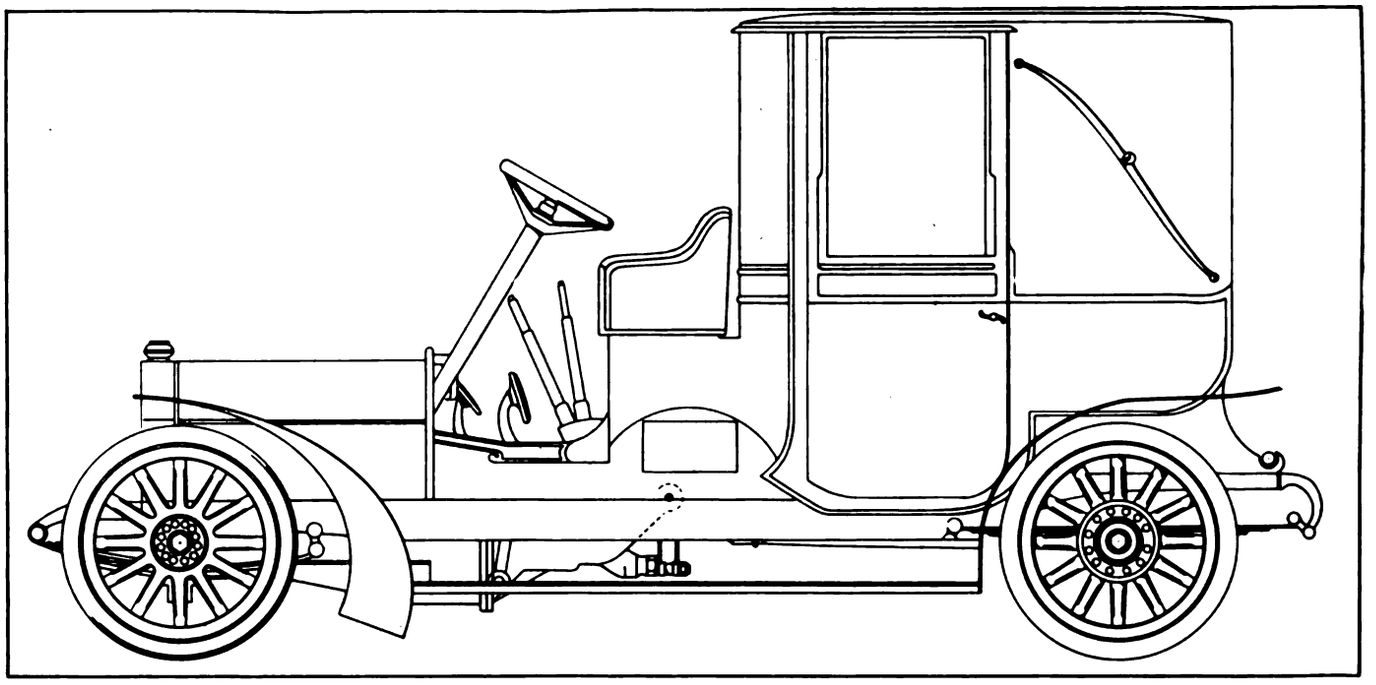
By Joseph P. Fox.

PUBLIC vehicle service the world over has been with reference to the demands of the people, whose needs may be more or less dependent upon conditions. The utilization of the motor conveyance has in many communities, especially in the larger cities, extended to such service, and companies operating in some instances hundreds of cabs are not unusual organizations. Such companies are organized for pecuniary profit and it is essential that they be profitable, as should be every business enterprise.

It is natural in engaging in any work that experience will develop needs and policies. In the transition from the animal to the motor vehicle it has been found in every instance that factors of large importance have been overlooked or underestimated. The essentials of business custom or methods have been seldom lost sight of, but ignorance of the use of motor cabs and the changed conditions resultant from extended radius of movement have wrought developments that must be accepted and must be dealt with.

It is impossible to deny facts and it is equally certain that the motor cab is the only vehicle that will meet the requirements of the people. The public must have a cab. This demand is imperative and is universal. The people cannot have a satisfactory public service provided by private corporations unless this can be conducted to a profit, and a profit that will equal what might be gained in other businesses. Neither can patronage be impelled unless the fare charges are reasonable.

This focuses attention to the cab itself. Undeniably the vehicles that have been in service have been more or less experimental in the sense that each design and construction had not the service to justify a conclusion that it met fully the demands of every interest. In fact, only after several years of use has it been possible to judge with fairness whether or not some machines have been desirable for such service. Again with the development of motor cars the people have demanded that such improvements be incorporated in public cabs, this entailing more or less costly changes for the operating companies. It has been experienced that the machine that might be satisfactory for use in one locality was wholly unsuited to another. Another fact emphasized by continued service was that it was necessary for the cabs to be operated as nearly continuously as possible, and that a heavier and more enduring construction than had been the vogue with pleasure machines was a vital need. In connection with this, simplified mechanical design, or minimizing the number of parts, especially those moving, was found absolutely necessary. Mechanism that would endure under excess work, that would not easily become deranged, that could be restored when necessary with the least loss of time and a minimum of expense and labor, that could be operated with economy in consumption of fuel, lubricant and tires, that would have sufficient power and speed, has been the goal sought by engineers.

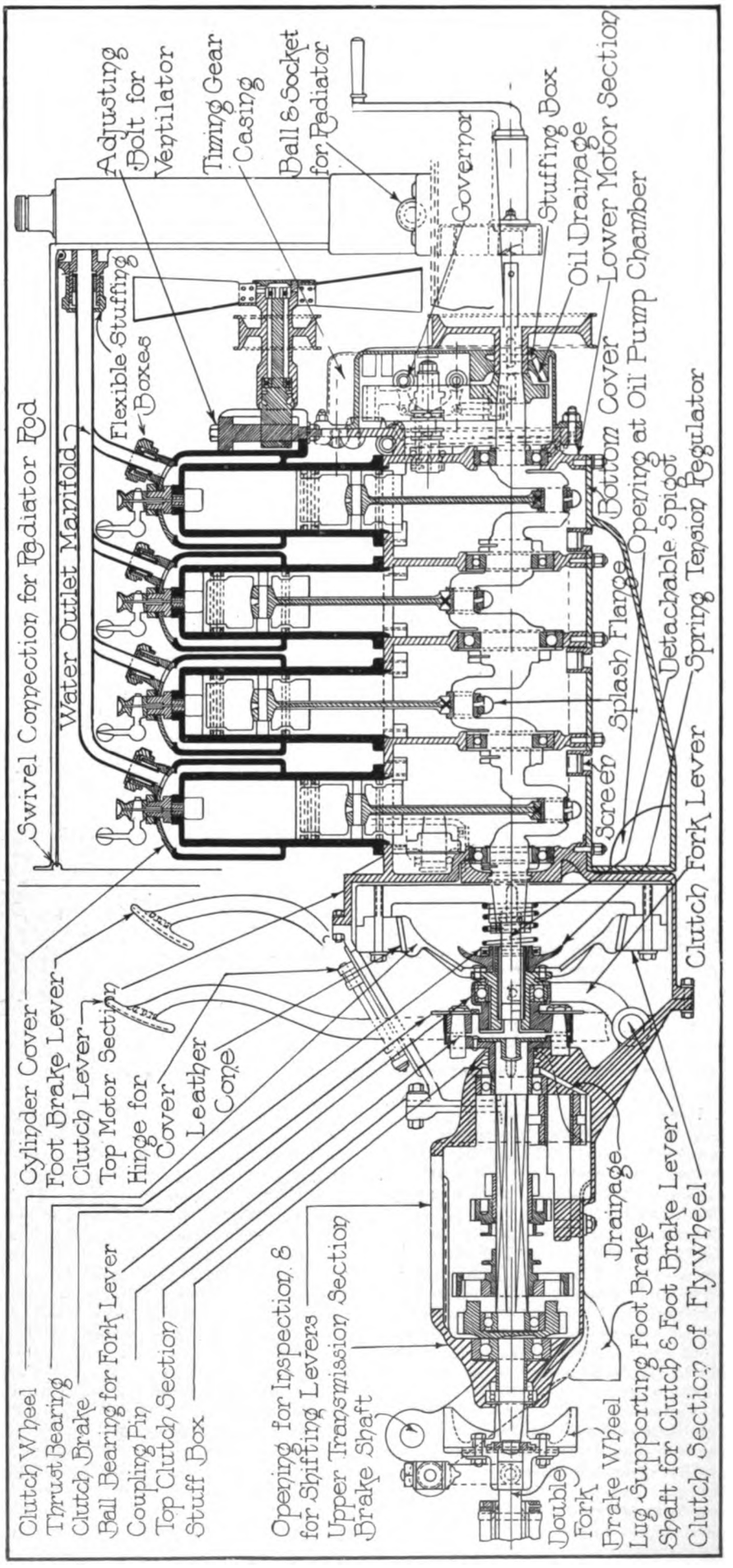


The Fox Public Service Cab, Designed for Five Passengers, with Left Side Control on Long Wheelbase Chassis to Secure Riding Comfort and Lessen Mechanical Wear.

In considering public service it has been invariably the experience of the companies that have been profitable that the best equipment that could be purchased was the most economical in that it endured the longest, had appearance that attracted patronage, and met the requirements of the people. This means, of course, that urban conditions are to be dealt with. So far as the people are concerned there has been no change in the quality of service demanded with the transition to the power cab. In fact, the cabs that make the best impression in finish, that have the power and speed, that are the least noisy, are patronized to the rejection of those which have not all or the most of these qualities.

After extended study of the subject during a long engineering experience abroad, where power cabs have been in use for fully a decade, and careful observation of the conditions generally obtaining in this country for a continued period, the writer has become convinced that the

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Unit Power Plant of the Fox Public Service Cab, the Motor of Four Cylinders, 90-Millimeter Bore and 120-Millimeter Stroke, Producing 20.17 Horsepower Under the S. A. E. Rating. This Assembly Includes the Clutch and Transmission, the Whole Being Enclosed in a Sectional Housing That Affords Ideal Protection to the Mechanism, and Which Is Extremely Accessible.

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requirements of public service differ but slightly, while the needs so far as the vehicle itself is concerned are practically the same. Neither is there a material difference so far as the cost of the machine enters into the proposition. While it is true there may be variance in differing items of operating expense it is also a fact that when these are collectively regarded, or even separately compared, it will be found results are surprisingly similar.

I am firmly convinced that the public automobile cab must be at parity with the horse equipment of the large and successful service companies. It must have every quality to impel patronage and to be profitable as an investment. Such a vehicle cannot be low in price or mediocre in design. It must be uniform in every essential detail and it must be harmonious with conventionalities as viewed by the motorist, by the individual who regards appearance and by the person who has merely practical requirements. It must be economical of operation from every aspect, for only by its aggregate economies will it be profitable. This means economy of time through certain and continued speed, through continued service, through immunity against derangement or failure, through accessibility of mechanism when repair or restoration is needed, through ease of adjustment for wear, through interchangeability of components, through the use of the highest quality of material; economy of operation through low fuel consumption, through minimized need of lubricants, through small tire wear per mile driven, through low cost of parts necessary for replacement in restoration, through elimination of the customary causes for wear, through positive lubrication, through minimized labor in ordinary care and attention, through utilization of a large part of the power developed, through certainty of control during every condition of service and through the great endurance of the entire construction.

In the matter of appearance it goes without saying that the vehicle will be desirably maintained so long as it is profitable and is utilized by the people. As a business proposition it must be kept to a standard, and when it has ceased to be desirable for passenger requirements it may be diverted to another form of service, for which it may have practical qualifications. It is not practical to make estimate of the cost of such a cab as I have outlined for so much depends upon the conditions for designing and experimentation, upon the expense for factory equipment, upon the character of workmen, upon the character and quality of the material, upon the quantities of material purchased, upon the assembling and inspection, and upon the cost of selling. It may be assumed that there will be wide difference in these items according to circumstances of production and where manufactured.

Having considered fully all these aspects and requirements I have designed a motor cab which will probably combine every practical quality that is necessary or desirable. It is not experimental in the application of any principle. Nothing is theoretical. Every construction has been demonstrated to be thoroughly mechanical and every detail has been adopted with a view of creating what will endure hard service and make for economy of operation. There is a wide margin for safety in every element. Despite this there is no excess weight that will entail increased tire wear. The purpose has been to have adequate power with a minimum of fuel consumption, to eliminate friction so far as possible, to use this power to the fullest advantage, to have a sufficient speed to afford a satisfactory service, and have the capacity for the extremely varied work required of a cab.

In this design the chassis and body equipment has been considered, but the chassis will be reviewed specifically and the body installation only insofar as it has been regarded in its relation to the proportioning of the chassis. But it is evident that the capacity of the cab and the work it has to do must influence every mechanical detail of the chassis to a certain extent. This cab has been designed to meet the requirements of the police regulations of Berlin, Germany, which compel that two passengers be seated comfortably on the rear seat of the enclosed body, that there be reserve or folding seats for two additional occupants of the body, and that there be ample room for the driver and a seat for a fifth passenger beside the driver, making in all six persons that the vehicle will carry without crowding. Another essential is that such cabs be turned in a 10 meter street (approximately 33 feet) without cramping or backing. This ease in turning is a quality much to be desired in narrow streets and in ordinary country roads. Aside from this it minimizes the element of danger from backing. The wheelbase is 2965 millimeters, or 116.759 inches, this being as long as this turning requirement will permit for the purpose of obtaining the additional ease in riding so essential for comfort and minimizing the stress of operation upon the mechanism of the vehicle.

The foreign service for motor cabs is exacting in that in many of the large cities it is not infrequent that they are hired for comparatively long journeys by tourists who do not have their own machines abroad with them. They are driven over good roads in many instances, but there are indifferent and poor highways in Europe, as there are in this country, and often these ways have gradients that are several miles in length on which the motor is required to do its hardest work. On such grades as these it is necessary that the brakes operate positively for the protection of the cab and its passengers and for those who are also using the highways.

In cities the proportion of good streets is generally larger than in this country, but in some sections the paving is ancient and driving upon it causes severe stresses when speed is attained. This condition parallels what may be found in the principal cities of America and it is a fact that adjacent to these communities the roads are by no means poor. Very often they are excellent and it is unusual to find the extreme grades to be met with in many European nations. In England, for instance, where the highways are regarded as being very good they are also narrow outside of the towns and cities, and they are quite as steep as they are in continental countries. The roads of France are not without the long grades despite the admirable character of the surfacing of the "routes nationales," and in some sections of Paris paving may be encountered that would almost cause an uprising did they exist in this country.

It will be seen that the use of the public cabs in Europe is quite often very similar to that for which touring cars are employed in America. Because of this it has been deemed desirable to make the wheelbase length equal to what may be considered satisfactory dimensions in the United States for pleasure vehicles. There is no question that this produces a better all-around machine even though there may be an advantage with a shorter wheelbase for use in extremely congested traffic. As a matter of fact it is entirely reasonable to believe that the requirements of the cab service in America will more and more parallel those of Europe, and this being so the longer wheelbase cab will be preferred because of the qualities referred to. It is the comment of those who have contrasted the types of long and short wheelbase cabs that there is decidedly more comfort with the former, to say nothing of the lessened wear of the mechanism. The same condition applies with other forms of motor vehicles similarly differing.

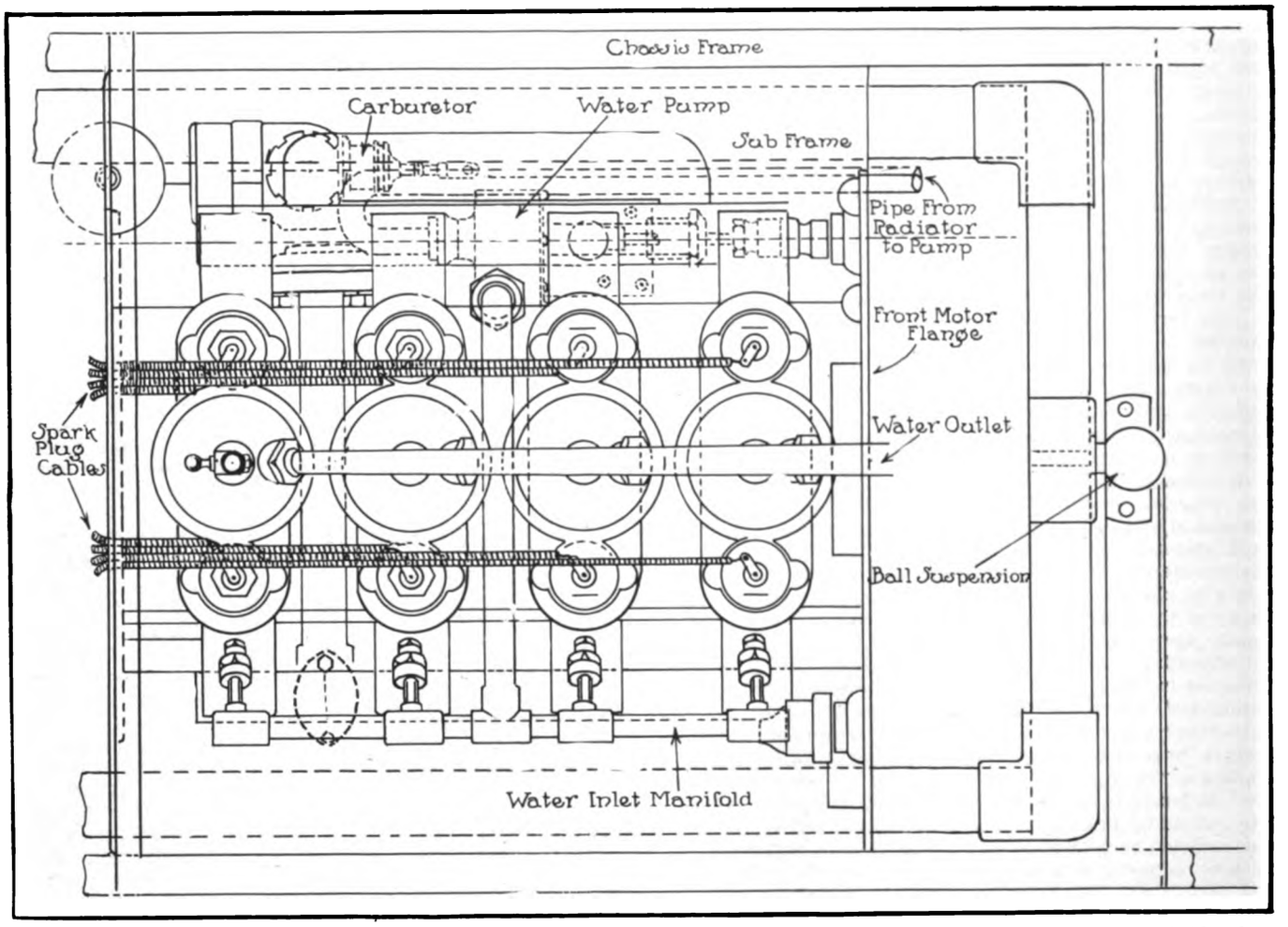
With any form of motor vehicle the power plant and driving mechanism is the most costly and deteriorates with use proportionate to the care given. The term used covers the motor, clutch, transmission or gearset, driving shaft and rear axle. These must be designed with reference to the service, and the one must bear a harmonious relation to the other. It is not practical to expect a combination that will be in every way satisfactory unless every element is created to meet a positive need or condition, because no weakness ought to exist or develop when it is possible to insure against it. It is almost needless to point out that it is only through analysis of every detail and the most careful consideration of every possibility that the best results can be obtained. This does not mean the use of an inferior or less enduring material because of the first saving in cost. Neither does it mean the elimination of a part or a fitting that will serve an essential purpose because of construction economy, nor inferior workmanship when exacting work

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means slightly increased expense. It has been stated by those who comment from experience that initial expenditure for a cab is not the main consideration with the purchaser, for the maintenance cost of the low price vehicle is certain to be relatively much in excess of the more expensive machine. This is not a reason for extravagance in any respect, but is the best argument why no desirable quality should be sacrificed or neglected in designing or constructing.

It has been stated that the elements of the car should be consistent, and this brings us to the most vital group, the engine, which should be no larger than is necessary to yield the service and yet adequate for all requirements. For obvious reasons the motor should be somewhat more productive than is really necessary under the best of conditions because of the fact that it should have sufficient reserve power for the worst. It must at all times do the required work well enough to satisfy the owners and users. It must be economical of fuel, especially in Europe, where gasoline costs approximately double what it does in America, and the operating expense is correspondingly increased. One of the most cogent reasons for the use of comparatively small cars in Europe is the excessive price for fuel as contrasted with its cost in this country.

The motor from the aspect of fuel consumption must be as small and as powerful as is possible. When it is realized that the service of the cab may be from 12 to 20 hours daily and the mileage may be as high as 75, though the average may be from 60 in New York to 50 in Berlin and to 100 in London the full significance of the saving in gasoline is apparent. This brings us to the matter of cylinder dimensions, which proportions, when combined with engine speed, determine capacity. Considering every requirement of the cab I believe that a bore of 80 millimeters (3.149 inches) and stroke of 120 millimeters, (4.724 inches) affords the most practical machine for cab work in that it is sufficient for all normal requirements and, with a four-speed transmission, it will do every work that ought to be expected, not only of a cab but a touring car. This motor rates under the R. A. C. formula, which is known as the A. L. A. M. rating in America, 20.17 horsepower. Under the French and German horsepower ratings the horsepower is established at 24, which is approximately what it will develop at 1200 revolutions. At 1000 revolutions a minute this engine ought to drive the cab on a level at from 35 to 40 miles an hour. With a touring car equipment the chassis should attain a speed of about 50 miles on the same gear, which is the direct coupling. With the fourth or top gear ratio this speed ought to be considerably increased. These figures are stated to establish the capacity of this engine, which is of dimensions that have been amply proven in continued European practise. While the motor may appear small by horsepower rating this is not a sufficient basis for determination. Judgment should be upon what the engine will accomplish, and with the four-speed transmission it is possible to utilize the power to decided advantage and yet economize in fuel and lubricant.



Plan View of Fox Taxicab Motor Assembly, Showing the Water Inlet and Outlet Manifolds, the Arrangement of the Cables for the Double-Spark Ignition and the Ball Suspension for the Sub-Frame.

In other words, the engine has been designed with a view of having ample power for the service and yet it is to be economical from every point of view. The highest speed is within the 1000 feet of piston travel a minute that is regarded as the maximum for continued use, and the normal operation of the motor ought to be from 800 to 1200 revolutions. Within this range with the four speed changes every requirement should be met without overtaxing the engine. A near approach to ideal operation would be a comparatively slow speed motor giving any desired car speed on slight grades and over roads by the spark and gas, but still having a full reserve for starting and for heavy grades by a sufficient range of gears for the desired speed without racing the engine. Such conditions only make for economical and satisfactory service. With the use to be made of

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the cab it is necessary that every factor that will make for endurance be utilized to the fullest extent and so far as possible the vehicle should be driven well within its capacity and never to its limitations. This fact has been regarded throughout the design and provision has been made to prevent what might be termed abuse or over-taxing the machine.

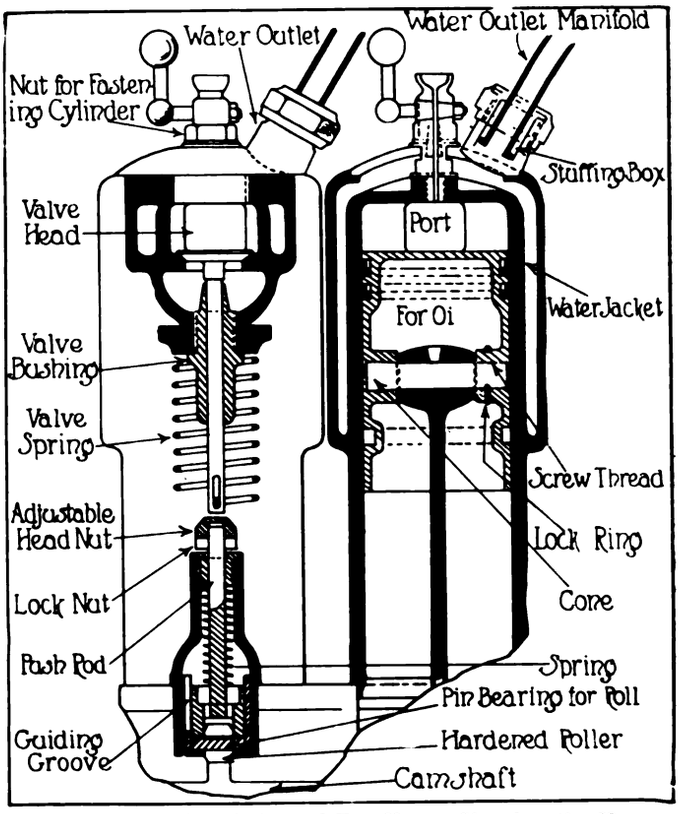
The choice of the motor dimensions and the character of the transmission are two decidedly important factors in cab design. To my mind on them depends very largely the success of the entire proposition. But no less important is the construction. For instance, the bushings should be as numerous as is consistent that the stresses upon the shafts be minimized and leverage pressure be eliminated or reduced to the lowest degree, so that both bearings and shafts will wear for a long period of continued use without noticeable deterioration. Every bearing must be of a standard type that they may be replaced at any time without special fitting. The ball bearings made by a well established firm would meet with all requirements, for such are usually standardized and a new bushing case will fit exactly in the seat of that replaced. In this design aside from the connecting rods there are no plain bearings used. All others are of the ball type and these may be removed and replaced by others without fitting. The wristpin and crankpin bushing are of a white bearing metal and are of liberal length as they take the blow of the explosions in the cylinders. It is to be noted that the use of such bearings minimizes the friction and allows the fullest delivery of useful power at the traction wheels.

In connection with the use of ball bearings it should be stated there are five main bearings for the crankshaft, each of them of large size and firmly seated in the webs of the engine case. With these there is no stress upon the crankshaft that is not well within its capacity for resistance. The camshafts are mounted in three large ball bearings. The shaft extensions that carry the timing gears are similarly mounted, and in the clutch, transmission, the driving shaft, rear axle, front wheels and in every part where such bearings can be installed they are used. This form of construction may be regarded as expensive, but this is one reason why the motor will do the work that has been stated, why the motor is economical of fuel, and why it will endure and is inexpensive of maintenance. The economy more than offsets the initial cost.

One of the most essential features of design is that the working mechanism of the car be encased for protection against dust, abrasive substances and destructive accumulations, a single housing containing practically all the moving parts of the engine, the flywheel, clutch and the transmission. This assembly is in every sense a unit. It is so constructed that it is in every way accessible and it is possible to remove it from the chassis by removing four bolts and hoisting it out. It can be taken from the chassis and another unit replaced and connected by two men in an hour and a half, perhaps in less time. It is entirely practicable for a spare power plant unit to be kept for emergencies and should it be necessary at any time to do so it may replace that in a chassis and the cab continued in use while work is progressing on the one removed.

The casing is one of the most important features of the design. It is sectional, of aluminum castings, and any one of these sections may be removed to examine or work on any part. To illustrate, the engine case or base proper consists of an upper section to which the cylinders are bolted, a bottom section and a base or bottom plate, the upper section carrying the front of the case proper. The bottom section forms the bottom of the housing for the flywheel and clutch. Back of these is the bottom section of the transmission case. Above the rear extension of the lower section is the top section of the flywheel and clutch housing and in this is an inspection plate or handhole. Back of this is the top half of the transmission case, in which is also an inspection plate. Bolted to the front of the engine case is a case or cover for the timing gears. The different compartments are entirely separate and apart from each other. The case, though in sections, is exceedingly strong and it is comparatively light and is stiffened by the transverse webs and flanges. All of the joints are lapped so there are no weaknesses in the design. The case is designed so that by the removal of a few bolts any moving part may be inspected, examined or worked on without dismantling the motor, which is an exceedingly important feature, and no adjustment need be disturbed.

To illustrate possibilities, the timing gear casing may be taken off and the engine operated, showing the time gears in operation, the condition of all the forward bearings, and state of the engine governor. By removal of the bottom plate every main bearing can be examined, the condition of the camshaft bearings and the big end bearings of the connecting rods seen, and the pistons and connecting rods may be removed entirely and work performed upon them. In this manner, too, the cylinders may be cleaned of carbon from below in a manner quite as thorough as if they were removed from the case. By removing the caps from the big ends of the connecting rods, the rods and pistons may be dropped out and cleaned, the rings examined and the condition of the wristpins seen. The bases of the cylinders are machined to fit into the openings in the case and the fit is accurate, this affording a better anchorage, and the cylinder bore expands at an angle at the bottom for



Sectional View of Cylinders of Fox Motor, Showing the Manner of Holding the Water Jacket Caps, the Water Outlet Manifold Stuffing Boxes, the Low Wristpin, the Rings and Oil Chamber of the Piston, the Valve and the Valve Operating Mechanism.

a half inch, this permitting a piston and its rings to be pushed up into a cylinder without difficulty, the rings contracting to the cylinder diameter under comparatively slight pressure.

There is another even more convenient manner of performing such work which will be described in connection with the mounting of the motor.

The engine case is given a maximum strength with a minimum weight of metal by the bridge design within the assembly. It is protected against stresses by its suspension in the sub-frame. It cannot be twisted or distorted or the shafts sprung or misaligned through any legitimate use, and nothing short of complete wrecking of the vehicle would materially affect the mechanism.

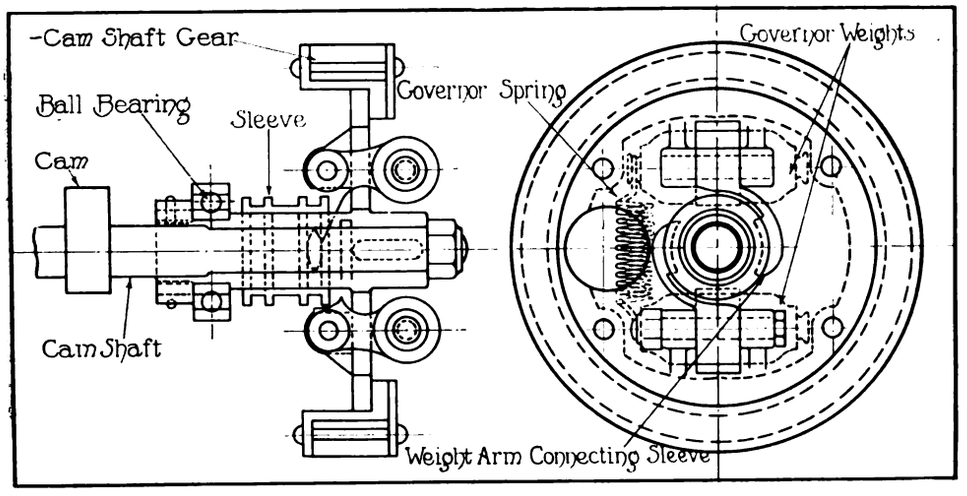
The cylinders selected for the motor are cast singly, this form of construction being chosen for a number of reasons, all of which are valid. These might be summarized thus: The single-cylinder unit is first of all the cheapest from a manufacturing point of view, this meaning the least cost, but it is also possible to secure uniformity of wall thick-

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ness (an essential for efficient operation), to have the water jackets completely encircle the cylinders, to thoroughly clear the water spaces of core, to later on clean them of scale and deposits that might reduce radiation, to economize in machining and finishing, and to minimize expense if it is necessary to replace a cylinder. The cylinders are cast with a wide opening at the centre of the head which is covered with a plate secured by a nut through which the shank of the compression relief cock passes to anchorage in the inner cylinder head wall. This opening makes possible removal of core and deposits and examination of and repair of the cylinders under certain conditions that would mean replacement with any other design. Where a damaged cylinder is by no means a remote possibility the dual cylinder unit or the en bloc design would mean a decidedly larger expense for replacement. With the water jacket completely about the cylinder the cooling is made more effective, a very potent element in continued service of a car.

The head is of the T form with the intake at the left side and the exhaust at the right. The design is the most practical for any cab in that it permits the use of a double set of spark plugs for ignition, each plug being located in the head of the valve pocket directly above the valve. The two plugs are fired simultaneously in each cylinder, this insuring a much more rapid combustion of the gas and naturally a greater expansive force from the explosion of the charge. This form of ignition does not require so great advance of the spark and consequently there is lessened resistance against the compression stroke, and with the firing when the piston is nearest top centre greater power is developed. With this design it is possible to use a thinner and more rapid burning mixture, to economize in fuel and lubricant, and to produce results that have been established as practical in every way. It will not be disputed that each charge of gas of stated proportions has a definite heat or power value and the utilization of this power depends upon the design of the motor. It can be stated that much of the heat value of the mixture is lost through incomplete combustion and where combustion can be improved it is obvious there is a saving. Theoretically the time to fully energize the power stroke is when the piston is exactly at top centre and ready for the downward movement. Any power exerted upon the piston before exact top centre must be overcome by the power stored in the flywheel momentum and is manifestly lost, while if not exerted at top centre the expansive force is reduced in proportion to increase of combustion space by the downward piston movement over the combustion head area. The maximum of power development is nearest realized by the use of the double ignition system.

As an illustration of the strength of this claim and as an example of how important is the ignition system of motors for power vehicles it is significant that in practical tests the double spark system has been proven to develop 16 per cent. more horsepower from the same motor than was realized by the single spark system. The tests to which reference has been made were in January of last year before the Society of Automobile Engineers on the dynamometer of the Automobile Club of America. The engine with the single spark ignition reached 24 horsepower at 1750 revolutions, which was the maximum obtained, there being a reduction in power delivery above that of speed. With double ignition and no more change than simply adding the second set of spark plugs to the engine it was found that it delivered 24 horsepower at 1500 revolutions, under exactly the same conditions. The power was increased to 28 horsepower at 1950 revolutions. The extreme gain absolutely established was approximately 16 per cent. It will be seen that this means practically a gain of one horsepower for every six, or taking the motor under its A. L. A. M. rating (20.17) with this form of ignition on the basis of the tests it ought to develop 23.39, a very material increase of power. This additional power is a substantial reason why this form of ignition has been adopted for this cab motor, especially as there is no increased consumption of fuel. As the ignition means simply one more set of wires from the magneto and one more set of spark plugs it will be seen that there are no complications. Besides all this there is the added protection from failure of a spark plug, the breaking of a secondary wire, or any other probable defect that might seriously impair the efficiency of the engine. The ignition current is supplied by a Bosch magneto designed for the double spark system, this being a true high-tension instrument.



Governor of the Fox Cab Motor, Which Is Contained Within the Camshaft Gear and Operates a Sleeve Sliding on the Shaft, Controlling the Supply of Fuel to the Motor.

The form of the cylinder with its relation to water jacketing and radiation has been briefly mentioned. The water jackets are large and the water is circulated through a flanged tube radiator by a positive pump. This type of cooler is advised as it is not susceptible to serious damage should it be frozen and it may be easily repaired should it be so damaged. The water passages are large and the water is circulated freely. There is less possibility of organic deposits accumulating in the bottom of the radiator from the heating of the water. The water is forced from the radiator by the pump to a manifold extending along the cylinder heads and connecting with the water jackets directly above the exhaust valves. The water is injected across the jacket of the exhaust valves at an angle that directs the flow to the bottom of the water jacket at the opposite side of the cylinder where it is turned to either side and after circulating about the base of the jacket it flows upward to the upper portion of the chamber and is forced out to the radiator through a manifold with connections with easy curves to insure a free movement of the water.

The plates covering the openings in the cylinder heads carry the connections for the water outlet manifold and the connection is made by the manifold tubing set into stuffing boxes, this giving a water tight but flexible joint. The radiator end of this manifold is similarly connected with the radiator and there is similar flexibility of this joint. This eliminates all rubber tubing with the sources of trouble from deterioration, the circulation of the water is positive and certain, while the water piping can be disconnected with the greatest ease. Any possible movement of the motor assembly is provided for and the water circulation will not be impaired. There is none of the customary annoyances of the other forms of connection.

The motor is lubricated by a combination of the force feed by a gear driven pump and splash. The bottom of the crankcase is divided by the webs into four compartments and below the base of the rear compartment, formed in the housing is the reservoir for the oil. There are drainage holes in the webs and in the division so the oil always fills the reservoir and is maintained at a predetermined

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level in the compartments when the engine is at rest. Driven by the inlet camshaft at the rear of the motor is the pump which is installed in the reservoir and can be reached from the outside of the engine case. This pump draws the oil from the reservoir and forces it through large tubing to points above the main bearings whence it flows over the bearings and into the compartments into which the crankpins and big ends of the connecting rods sweep. The oil is also forced through the forward main bearing into the timing gearcase and thence is distributed by splash over the timing gears. Stuffing boxes prevent the oil working out of the timing gearcase around the main shaft end and at the rear of the engine case, these being provided with drainage into the forward and rear compartments so that any excess lubricant is siphoned from the stuffing boxes. The caps and bearings of the connecting rod big ends are drilled for a free circulation of oil about the crankpins. As will be obvious the oil accumulates in the channels of the ball bearings and there is always a sufficient volume of oil in these bearings.

The lower ends of the pistons when at the lowest point in the cylinders are below the base of the cylinders. The wristpins are set a little above the exact centre of the pistons to remove the wristpin bearing as far from the head as is possible, where the heat is not as intense and the wristpin lubrication will be the most effective. This minimizes the side thrust of the piston on the cylinder walls as well. The pistons carry six rings, four above and two below the wristpin bearings, and between the ring groups the piston is machined slightly smaller, this space filling and carrying a volume of oil when the engine is in motion that constantly lubricates the walls of both cylinders and pistons. The six rings insure a higher compression in the expansion chamber and steady the piston in its movement, there being no possibility of violent contact of the piston against the cylinder wall under any condition of operation.

The valve action is unconventional in that there is a spring fitting that constantly maintains the pushrods in contact with the cams, minimizing noise and insuring against undue wear. The cams are retained on the camshafts by collars. The pushrod guides are screwed into the engine case and are retained firmly by keys. In these guides are the pushrods which are hollow sleeves in the lower ends of which are hardened steel rollers or wheels. The roller shafts mesh into slots in the lower section of the guides, which prevent turning. On top of the guides are caps through which the pushrods rise and fall and at the head of the pushrods are adjusting nuts by which the clearance is established. The valves are of nickel steel and the stems of the same material. The pushrods carry collars and between these collars and the cap of the guides, surrounding the rods, are spiral springs which force the rods downward with the release of the cams. The action of the pushrods is positive and there is always abundant lubrication.

Back of the engine case is the case containing the flywheel and clutch assembly. There is a recess in the rear web of the case into which the rear main bearing is seated, and against this is a large recessed collar that contains the rear stuffing box. The clutch is of the cone type with the spring retained between the web of the flywheel and the clutch member, the flywheel face being divided for the insertion of the clutching member. This member is screwed on to the end of the coupling shaft and locked firmly. The clutch is so designed that by unscrewing the coupling shaft and two retaining bolts of the flywheel the clutching member may be removed from the case after the removal of the upper half of the clutch casing. The removal can be performed in an extremely short time without in any way disturbing any other of the mechanism. This clutch assembly has a ball thrust bearing to sustain the clutch spring pressure and another ball bearing to minimize friction between the axle and the fork lever by which the clutch is actuated. The crankshaft extension is removable by means of a special wrench which fixes the clutching member so that the flywheel may be turned. It will be noted that the connecting movement of the clutch when engaging is backward from the motor against the angle of the inside of the flywheel. One of the advantages of this design is that of modifying the oscillatory movement of the motor shaft and causing a softer motion of the transmission during the period of clutching. This is accomplished through the action of the lever and the expansion of the clutch spring. This oscillatory movement of a shaft is noticeable with a dynamo or electric motor and as a gasoline engine is driven by a comparatively irregular force this vibration of the shaft is pronounced. This clutch is so effective that a properly designed and assembled car may be started by it on any of the different speed gears and on any grade as softly and flexibly as can be a steam or electric vehicle. It is apparent that this manner of clutching materially reduces the wear upon any of the transmission members as well as making for the increased comfort of the passengers. The clutch and flywheel are contained in a housing that is oil and dust proof and there should be none of the causes of trouble that may be met with in other forms of construction. There can be no question as to the accessibility of the design.

The four-speed transmission has the highly important feature that it is possible to change from one speed gear to the other without passing through the gears between the two ratios. There is also the simplicity of movement of the shifting lever. There is an automatic brake attached to the clutch to prevent spinning in gear changing, which minimizes the wear upon the gears when changing speeds. By an automatic lock the gears are prevented changing while the clutch is engaged. On the extension of the transmission shaft is the service brake, which is operated by a foot pedal.

The control levers are in the centre of the chassis at the right of the driver, and these are mounted on the transmission assembly, there being no connection with the chassis frame side member, as is the customary form of design. This makes it possible to secure the true form of three point suspension that has been given this assembly. The engine case is cast with a wide flange at either side that serves to carry it and the clutch and transmission perfectly anchored on the sub-frame, this flange forming a complete deck about the motor and protecting it against dust, water, mud or dirt that might be thrown from the surface of the road. No drip pan is necessary.

The sub-frame is of heavy tube and it follows the sides of the assembly from the front to the rear. The forward end of this frame is mounted on a ball joint carried on the forward member of the chassis frame and at the rear end of the frame is a sleeve through which is passed a tubular member, the ends of which are mounted in slides in the chassis frame.

(To Be Continued.)

GAINS CONTROL OF UNIVERSAL.

Announcement is made from Detroit that Howard Walton of New York City has acquired full control of the Universal Motor Truck Company of the former city, and that a new concern will be organized with plans for a general enlargement of the business. The Universal company was formed about a year ago with capital of $350,000. It is understood that Vincent Link, designer of the Universal truck, will remain with the new owner as chief engineer and designer.

SPECIAL SHOW FOR PITTSBURG.

Following out the plan adopted by the Pittsburg Automobile Dealers' Association last year, a special week will be devoted to commercial vehicles in its show at the Duquesne Garden, Feb. 5-10. Numerous new lines are being represented in this city this season, and it is anticipated that the showing will be larger than in 1911. It will be remembered that Pittsburg was the first city, outside of New York and Chicago, to hold a separate truck show.

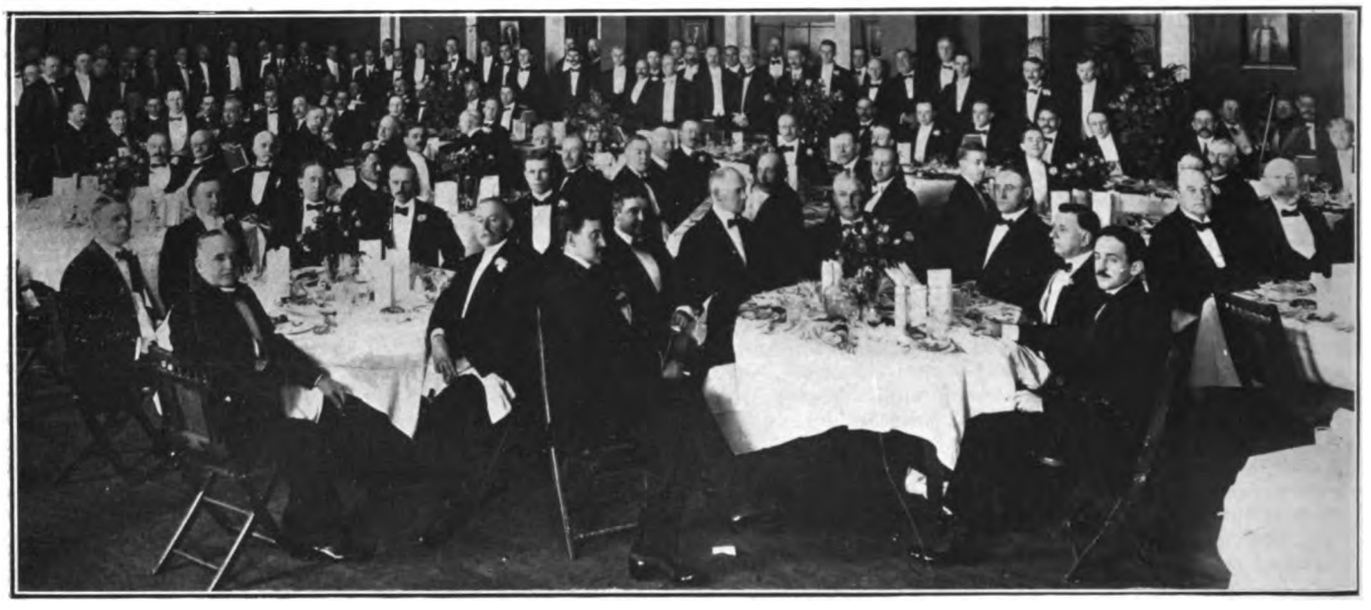
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"THE MOTOR VEHICLE FOR CITY AND STATE."

Discussion of Economies of Power Wagons for Urban and Interurban Transportation by Hayden Eames, General Manager of the Studebaker Corporation, Before the Boston Electric Vehicle Club.

THE subject of urban and interurban transportation by power wagon, with an attention to the utility of the electric type, was discussed at length by Hayden Eames, general manager of the Studebaker Corporation, at a banquet given by the Electric Vehicle Club of Boston to federal, state and municipal representatives located in Boston. The banquet, given at the City Club, was presided over by William H. Blood, Jr., president of the Electrical Vehicle Association of America as chairman, and LaRue Vredenburg as toastmaster. Mr. Eames' address was given as "The Motor Vehicle for City and State." He said in part:

It seems perfectly ridiculous at this late day to come here and undertake to tell this gathering much about the electric vehicle or any other form of motor vehicle. You will have noticed that I am supposed to speak here tonight of the motor vehicle in its application to the city and the state. Now it is just in such classification as this in which most of the mstakes on the subject of the motor vehicle have been made. Inefficient brevity versus undue qualification have obscured the main issue. There is the urban and the interurban service. You often hear the man on the street making an application of something to motor wagons when that belongs only to its application to city service or to interurban service. It is going to be difficult in this matter to make a compromise between ineffective brevity and undue qualification. Hardly any statement you can make regarding the motor vehicle is unqualifiedly or strictly true, and so I shall have to ask you to take it on faith.



Dinner by Electric Vehicle Club to Federal, State and Municipal Representatives Stationed in Boston, at the City Club's Banquet Hall.

One of the reasons Europe has helped us so much less in power wagons than in the matter of pleasure vehicles lies in the fact that recent interest in Europe has centred upon interurban transportation. The character of their roads and their high freight rate contribute a great deal to that. As long ago as 1903 the records in their urban transportation in Europe had a high degree of specialization and thoroughness. Acording to a report in the Liverpool Post they were transporting in that city freight at the rate of one and a half pence a ton a mile, which was extremely good at that time. One example is the Manchester ship canal. You all know that American speculators pronounced it to be impracticable. The railway freights were so high on account of short haul and frequent handling. But today it is not an objectionable thing.

As a result of this method of transportation Europe is away ahead of us not only in transportation, but also in highway upkeep. They found that the automobile and the horse together had about the same effect on the highway as a pickaxe and an air blast. The horse did the pickaxing and the automobile did the air blasting. It was found that the roads gave way much more rapidly than before. I understand under the special management of Harold Parker that problem has been solved, but as to how far they have gone in Europe I do not know. The whole thing turns on meeting that particular condition. It does not apply much to city use. There does not seem to be much doubt—and it is growing now in a more or less tentative manner in the West —that transportation from rail heads and way stations by automobiles is going to open up new territory. Possibilities in that direction are being recognized in Europe, and were recognized a good while ago. In 1898 the underwriters of the Belgium railway system found that by the migration of operatives from the Namur district to the Baltic provinces of Russia, the underwriting had become unprofitable. They ransacked the world to find out how they could put automobiles into that territory.

One of the things which the British have had to encounter, and which this government has had to encounter in its interurban transportaion was the strength of bridges. In England they dodged that issue by adding the seven-ton lorry and the three-ton truck. In that way they got rid of individual units below that for which the bridge was constructed. The span style of bridges was found to be the best, and for military purposes this style of bridge is very good. For military use the weight of the gun limber is about 7000 pounds, and that is the limit as given by the engineer corps. Strange to say, this country is rather ahead of Europe in military experiments in the direction of automobiles for military purposes. In Europe the French and

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German authorities have come out directly, saying that they have no hope of using automobile company wagons or any wagons with the troops. They limit the utility of power wagons to transportation and rail head camps. One trouble of the power wagon is that as a rule it is not designed for the special work of burden it has to carry. In this country, beginning next month, and for the first time in the history of this country will be made the first experiments in automobile company wagons. That is quite a departure, and is being watched with a good deal of attention. It is the first time that any military company wagons designed for the purpose will be used, but they have not gone so far as to experiment with electricity. These wagons will be run from Indianapolis to the South.

Now in such a comprehensive subject as this I have to speak carefully. I want to differentiate the urban from the interurban conditions, and to deal with the economic conditions as well as with the effect of freight rates. You can easily see without much discussion what that would be. It is a question of having a haul short enough so that the railway does not get the advantage of infrequent handling—longer than the horse could possibly be considered for. But it is all secondary. One of the differences between the European truck and ours is that of the design of the wagon. I do not hesitate to say that there is not any power wagon today that is designed with distinct reference to economic use, for instance. The ordinary design, such as the electric company makes, comes nearest, but the gas wagons do not come near the urban requirements.

You will get the idea when I call your attention to the difficulty of the detachment of units and the matter of mechanism. A five-ton truck costs about $4000 to the purchaser. He has to have spare trucks. The average number of spares in London was 30 out of every 100, and those 30 were under repair all of the time. They looked like lumps of sugar with flies on them. The floor of the machine shop looked like a gigantic watchmaker's bench. The secret is to have the units detachable, as is done in the electric vehicles, and that makes one of the cogent reasons for its superiority. Those things are not developed in Europe, partly because of the interurban service and partly on account of the maintenance charges. That difference in wages is also a fact.

But it is the urban delivery that really interests us. There are very few parts of the world where the roads are good enough to make interurban service of sufficient interest. What is very true about interurban service is frequently untrue about urban service. There is a great deal more information about the economies of urban transportation than most people believe. A man will say, "Yes, I know how that takes place," but in many cases you have to say, "No, it doesn't take place." And that seems to settle itself. The actual cost of an installation today can be reckoned without trouble, for there are ample data, and where these estimates have been made synthetically and tried out afterwards they have absolutely justified themselves, and that so-called question is a foolish question.

The day has gone by when the old-time idea of a "practical man" was a matter of admiration. That is, I mean of a practical man who has no other knowledge than that which has gone into his own life. You have to apply other people's knowledge as well as your own, and if you adopt that principle I unhesitatingly say that certain estimates I am going to read to you are as absolutely certain as if they had been actually done. There is not a single item among them that has had to be cast out in the slightest degree. The majority of articles received from time to time in the magazines and technical papers are written by people who have just waked up. They do not know more than the first notion about this thing, what information there is about it, and how other people have studied it.

Business men have not awakened to the possibilities of the electric vehicle. They have not watched its progress, nor do they realize how economical it is. The best proof of this was contained in a remark which was addressed to me today by a business friend who stopped me on the street and asked me what I was going to do in the evening. I said I was going out to dinner. "Can't you shake it?" he asked. "No," I said, "I have an address to deliver." "What is it about?" he asked. "It is on motor vehicles and the methods of transportation." "Well," said my friend as he grew enthusiastic over the electric commercial vehicle, "the power wagon is going to come." Now these people who say that it is going to come overlook the fact that it has been coming for 15 years past, that it is now here and has been here. Yet my friend had only just begun to realize it. The horse has been at a distinct disadvantage for 10 years past.

In 1901 and 1902 electric trucks were being produced and were transporting freight more economically—considerably more economically—than horses. The first automobiles developed as steam vehicles were followed in this country by the electric. Then the electric versus gasoline question began to occupy everyone's mind. There is not much of that now. It boils itself down to a question of mechanism and of drivers' wages. There isn't a doubt that the maintenance of the electric is much less than that of the gas driven car, and the electric has a tremendous advantage in the larger stations. The storage battery is improved greatly, but it was better than the horse then.

I remember that one great express company put in a lot of batteries and they were continually fooling themselves. The president of one big express company was stampeded by the taunts into putting in some electric vehicles in undue haste. They were shipped to a northern city. The batteries went out with no hold down and the freight was shipped to this station the same time as the vehicles. The drivers took the vehicles off the freight cars and then run them through the streets until the batteries ran out and then the drivers walked in. Those batteries gave out soon, and then came a man to replace the batteries. They had 12 wagons.

After this account had been cleared I walked into the man's office, and the mere sight of me almost drove him into a fit. He seemed to think I was to blame. At the end of the year I stopped there again and asked him how the installation was getting on. He said, "I hate to say so, but it has cost us less than we had set aside for the horses." He was deceived by that one experience, but they had to put in an installation, and that installation, when I inspected it was one of the best I know. There is the differentiation between the obvious and the real.

The electric vehicle has a tremendous advantage in large cities, as it moves quietly and is able to get to a designated point in a certain time—much less time in fact than a horse could cover the same distance. Picture to yourselves a London omnibus outfit and what gasoline vehicles require. With a gasoline station, no matter how serviceable or how good your equipment is, you have got to have a repair shop, and there must be a lot of mechanics in it. Now in an electric installation with 12 vehicles in it there never was a time when I saw more than three men there, and at no time out of the 20 occasions on which I visited it, did I see more than one wagon out of commission.

There is not the least doubt that the maintenance of electric vehicles is very much less than that of the gasoline vehicle. You can get more speed out of the gasoline, but for truck purposes this is not an advantage in the most congested parts of our city and under other conditions. I doubt if the streets will ever be clear enough to permit it. There has been a great improvement in the traffic of streets. The limits imposed by the present construction of streets might seem to be limits from intersections, and I don't see how that interference is going to be such as to deprive the electric vehicle of its advantage in the matter of maintenance.

Comparisons are misleading on account of misrating. Nearly all electric vehicles have been rated on the basis, roughly speaking, of the life of the wagon. The life of the wagon will be computed at twice the weight of the load. That will develop the result for horse wagons. They are getting closer and closer together, but many comparisons made on that basis are erroneous.

There is one point very frequently overlooked in power wagons. Not only will speed save travel, but increase in size will save travel. Time conditions are limited by overexisting conditions. But that problem is in a fair way of solution. It would not surprise me within the next 18

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months to see electric trucks as high as 10 tons travelling eight or 10 miles an hour. In view of this, street conditions will have to be considered to meet this. These trucks will be bought irrespective of any notions people may now have about them. A great many people will be getting themselves on this subject in the very opposite direction from what they are today. They will be buying blindfolded as it were, and the people concerned in municipal affairs and in the condition of the street would better look those conditions in the face.

One of the difficulties in the introduction of trucks has been that very fact of the relation between the speeds of trucks and their weight and size. I remember an argument we once had with a western man. We succeeded after a laborious discussion, and by the application of a little ordinary commonsense in convincing him. It took us nearly two months to convince this western man that he wanted a wagon twice as large.

Of course most of this is very general. Some of the facts I am going to give you have been taken from reports which you doubtless have read. Up to Sept. 1, 1911, $10,000,000 worth of electrical trucks were purchased in this country. There are said to be 1000 gasoline trucks, registration trucks, in New York. Two and a half million dollars' worth were bought last year up to Sept. 1. We figure that it will take about 76,500 kilowatts to deliver the retail freight annually taken off the railways of this city, let alone other freight. About 3,000,000 power wagons will be required for this country. About 16 times as much freight is handled on wagons in this country as on railways, and that includes rehandling.

There is a great deal of hallucination abroad on the subject of the low efficiency of the electric vehicle. The low deficiency runs from 39 to 73, and the electric vehicles run about 80 per cent. There is nothing in all this talk about the heaviness of the electric vehicle. The electric vehicle is no heavier for the service it is called upon to perform than is the gasoline vehicle.

I have here some particulars of installations that have been worked out synthetically. Some of these are actually in use, and some are not. One large horse and wagon installation by a large packing company cost about $194,000, and the cost of the electric machines was $166,000. The horse expense amounted to $136,600 and the machine expense was only $113,000, including depreciation and interest on investment, and it showed an annual saving of $23,600. Another similar packing house more favorably situated showed a saving of $15,000 a year. Such results as these are all built up synthetically, and the allowances for battery maintenance are all excessive. This has been confirmed not only by actual application in some of these cases, but by actual application elsewhere.

One of the most profitable installations I know of is that of A. I. Piercy in New York. The manufacturer who sold him vehicles made a contract with him by which a certain fixed charge was to be made provided the manufacturer had power to select the station superintendent. Mr. Piercy could not appoint the superintendent without the consent of the manufacturer. Mr. Piercy was to pay the manufacturer back one-half of that figure manufactured in excess over that figure. Ten months ago they had been going 2.5 years, and at no time had any vehicle exceeded one-half the estimate upon which the installation was based.

Anybody hearing that kind of a story would immediately ask why electric vehicles were not introduced a long time ago. What was the trouble? The trouble was the same as in the case of every invention ever introduced anywhere in the world. Mr. Blood, at the meeting in New York on Oct. 10 said it was inertia, and that is about as good a word for it as any other. It is perfectly astonishing to see how the human mind works on this question. It has a sort of positive kind of inertia.

I remember the first electric vehicle with which I was concerned. A local carriage maker put up the body of it. When it came to the work it had a whip socket on the dasher. "What is the whip socket doing here?" I asked. "Why, we have always put them on," was the reply. How perfectly foolish it sounds.

Suppose a man came into your office with an invention, saying: "I have the most wonderful motor you ever saw. It has no handles, no steering gear. All you have to do is to speak to it and it goes or stops." You would say that was wonderful. The man adds: "To be sure, it goes sidewise when you don't expect, and it turns around sharp, stops without notice and changes its speed." You would say: "Good bye. I don't want anything to do with that invention." That is what the horse does.

Here is another hallucination. There is a good deal of mathematics about this: One of the commonest things you get from the habitual horse user is the statement that one-third or one-half of your time is standing still, and you have to save all your time on the other half. The whole situation is speeded up to some extent, and the ideal time comes into the power wagon more than it does into the horse wagon. You make allowance for the poor beast to get there, but you have to allow for his average condition. You speed the whole thing up to meet that condition. As soon as you introduce the power wagon you put that all out. In the case of a New York express company, when it ran horse vehicles they stood idle 35 per cent. of the time; when they used power wagons they stood idle only 22 per cent. of the time. You have got to use the new tool. It has been the whip socket and the sharp shoeing business that has prevented people from taking advantage of that splendid economy.

I remember the case of a man in St. Louis who delivered packages from a dry goods store. He never sorted the packages until after they had been put into the wagon, and he took advantage of the idleness of the horse to take the packages out and then sort them on the curb. When that dry goods store put power wagons in it was another thing. Then he awoke to the new facilities. All of you must be familiar with that attitude.

I might mention here the municipal ordinances that make the taxicab in this country impossible. People amusedly try to explain why they don't pay. The real explanation lies in the fact of the non-paying mileage which in London is 12.5 per cent. of the total mileage. The non-paying mileage in Philadelphia and New York is 55 per cent., and the reason is that the particular form of ordinance in relation to the arrangement of cab stands is such as to enforce that dead mileage. That is simply another example of the whip socket. You remember that a year or so ago there was a great deal of agitation regarding what the automobile was doing and how it was ruining the finances of this country. We all know what nonsense that was.

THE MOTOR CAR INDUSTRY.

The December issue of "The Gramm," a monthly publication devoted to the interests of the Gramm Motor Truck Company, Lima, O., contains an interesting article by B. A. Gramm entitled "The Motor Car Industry." It presents pertinent facts relative to the commercial vehicle and gives some idea of the numerous machines in service as well as the large number of horse drawn vehicles replaced. The company also issued a special number devoted to its Canadian interests.

LUMBER MEN TO BUILD TRUCKS.

Eddy Bros., a millionaire lumber concern in Bay City, Mich., is said to have become interested in the purchase of the Owosso Motor Company, Owosso, Mich., and it is understood that if the plan materializes the business will be removed to Bay City, where ample capital will be forthcoming to produce light delivery wagons in large numbers during the coming season.

KANSAS CITY'S SHOW PLANS.

Kansas City is in the centre of a section in which it claims there are more cars sold annually than in any other locality in the United States. Inasmuch as the two dealers' associations have been amalgamated this year, it is anticipated that the display of Feb. 12-19 will be of large importance in the industry. Special provision has been made for the showing of commercial vehicles.

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BRIEF NEWS OF MANUFACTURER AND THE TRADE

The B. F. Board Motor Truck Corporation, Alexandria, Va., has created a preferred stock of $25,000.

The White Company, Cleveland, O., announces that James A. Harris, Jr., of the sales department, has been appointed advertising manager.

The J. I. Case Threshing Machine Company of Racine, Wis., has opened a New York City branch at 1860 Broadway. O. A. Lewellen is in charge.

The American Elastic Wheel Company, New York City, has been incorporated for $50,000. The incorporators include C. Feroci, F. Corsi and F. P. Ward.

The Moran Auto Sales Company, Grand Rapids, Mich., has been appointed agent for the Velie commercial vehicles by the Chicago branch of the Velie Motor Vehicle Company, Moline, Ill.

The Hartford Suspension Company, Jersey City, N. J., has opened a factory branch at 1524 Grand avenue, Kansas City. Henry Roemer is manager.

The Leighton & Hancock Motor Truck Company, 16 E. Walnut street, Columbus, O., has been appointed agent for the Sternberg commercial vehicles.

The Columbia Taxicab Company, Evansville, Ind., has been incorporated for $10,000. H. E. Hulseman, W. Wheeler and A. C. Mathias are named as directors.

The Nuse Wagon & Automobile Company has been incorporated at Newark, N. J., for $50,000. The incorporators were Fred Nuse, Louis Nuse and Fred Nuse, Jr.

The Automobile Horn & Pump Company of Boston was incorporated recently for $25,000. Anthony J. Son is president and Joseph Payne of Malden, Mass., treasurer.

The General Motors Truck Company, Detroit, has formed a service department in connection with the selling organization and this branch will be in charge of T. P. Myers.

The Penoa Motor Oil Company, Los Angeles, Cal., has been incorporated for $25,000. J. P. Smith, Joseph A. G. Brown and M. B. Armstrong are named as the incorporators.

The Automobile Omnibus Company of Lynn, Mass., was incorporated recently for $10,000. The incorporators include Eben R. Phillips, Patrice D. Theriault and James J. Liffin.

The Erwin M. Jennings Company, Bridgeport, Conn., has been appointed agent for the Alco trucks, made by the American Locomotive Company of New York City and Providence, R. I.

The Hydraulic Motor Vehicle Company, Milwaukee, Wis., was incorporated recently for $15,000. The incorporators include Calvin Stewart, August Baltzer, W. M. Stewart and W. E. Brown.

R. S. de Mitkiewics has resigned from the Motor Engineering & Sales Company of New York to accept a position in the truck department of the Peerless Motor Car Company of New York.



New Factory of the Federal Motor Truck Company at Detroit, Which Was Formerly Occupied by the Van Dyke Motor Car Company.

The Randolph Motor Truck Company of Delaware was incorporated recently for $200,000. The incorporators include H. O. Coughlan, Brooklyn, N. Y., and Welcome W. Bender, New York City.

The O. A. R. Motor Company of Plainfield, N. J., has been incorporated for $60,000 by A. A. Reed, E. J. Kuhne, H. G. Uhler, G. Reinberg and H. G. Uhler, Jr. The concern will manufacture motors.

The Powell Engine Corporation, 49 Lincoln place, Brooklyn, N. Y., will place a 1.5-ton truck upon the market shortly. It will be propelled by a four-cylinder unit power plant located under the driver's seat.

The Centaur Manufacturing Company, Buffalo, N. Y., was incorporated recently for $35,000 to manufacture motor car appliances. The incorporators include A. Schmidt, J. E. Barry and Bertha F. Schmidt

The Velie Boston Branch has reappointed Arthur G. Beharrell as agent for Lowell, Mass. The latter will maintain a service station, a feature of the policy of the Velie Motor Vehicle Company, Moline, Ill.

The Mercury Manufacturing Company, Chicago, received an order for 12 trucks recently from a laundry in that city which experimented with commercial vehicles of different types before placing the contract.

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Welch & Suthergren, Worcester Mass., has opened a show and salesroom at 673 Main street and in addition to the pleasure car is handling the Peerless truck, made by the Peerless Motor Car Company of Cleveland, O.

The Rowe Motor Manufacturing Company has been incorporated for $500,000 at Camden, N. J. The incorporators consist of Charles D. Besore, Marion Lambert, Florence M. Caskill, all of 104 Market street, Camden.

The Firestone Tire & Rubber Company, Akron, O., has opened a factory branch at Dallas, Tex., at 1521 Commerce street. It is in charge of P. B. Talbot, who for many years represented the company as a travelling salesman.

The Findeisen & Kropf Manufacturing Company, Chicago, has made the following additions to its list of agencies: Ballou & Wright, 86 Sixth street, Portland, Ore.; Browne & Leacy, Real Estate Bank building, Savannah, Ga.; Joseph Woodwell Company, 201 Wood street, Pittsburg, Penn.

The Morse-Readio Auto Company, Springfield, Mass., which was incorporated recently, will erect a five-story brick and steel garage on Dwight and Chestnut streets and will maintain a service station for a line of G. M. C. trucks for which the company is agent.

The Lauth-Juergens Motor Car Company, Fremont, O., has completed plans for a new building 250 by 60 feet which is to be utilized for assembling and body building. Another large structure will be erected in the spring to take care of the increasing business.

The Kerosene Gas Producer Company, New York City, announces the opening of a sales office at 1926 Broadway of that city, where all communications in reference to the business of the Universal Oil Converter Company or the Kerosene Gas Producer Company should be sent.

The Swanson Motor Company, 5719 Wentworth avenue, Chicago, announces that in addition to several lines of commercial vehicles it is specializing in heavy trucks, having received a large number of orders for this type of power wagon.

James F. Evans has been appointed advertising manager of the Lozier Motor Company of Detroit to succeed C. A. Emise, who has been promoted to the position of sales manager. Mr. Evans is well and favorably known to the automobile industry, and was educated in Oberlin College and the University of Chicago.

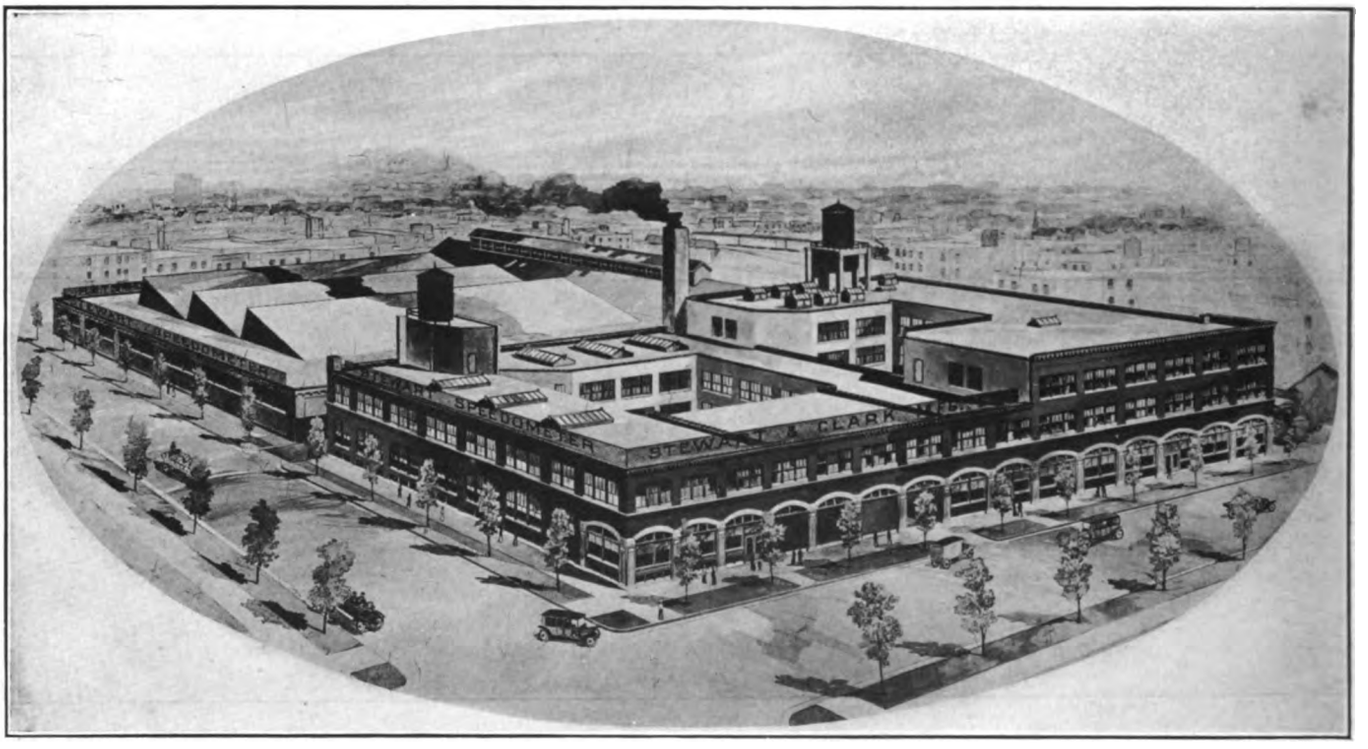
The American Locomotive Company, New York City and Providence, R. I., announces that J. F. Gfrorer has been placed in charge of its service department. He has been associated with the motor car industry since 1903, during which time he has filled many important positions with several well known companies.

The International Motor Truck Company, New York City, has removed its offices and salesrooms from 30 Church street to Broadway and 57th street, where four floors of the Demarest building will be utilized. Robert Fulton and H. D. Watson of the sales organization of the company will establish quarters at the new location.

The Remy Electric Company, Anderson, Ind., well known maker of lighting and ignition specialties, announces the addition of a new service station and supply house at Dallas, Tex. It will be in charge of M. A. Price, formerly of the New York City branch, and who has been connected with the Remy company for several years.

The Stewart & Clark Manufacturing Company, Chicago, recently completed an addition to its large plant at a cost of $100,000. The new structure is being equipped with modern machinery and will be utilized for the manufacture of drop forgings employed in the construction of the Stewart speedometers. In the accompanying illustration is depicted the factory of the company including the new building.

D. K. Moore, vice president and one of the organizers of the American Distributing Company, Jackson, Mich., has accepted the position of general sales manager of the Western-Mott Company of Flint, Mich. Mr. Moore has been prominently identified with the automobile industry for the past 10 years, having specialized in the production and sale of axles, wheels, transmissions and steering gears. He will retain his interests in the American Distributing Company.



Plant of the Stewart & Clark Manufacturing Company, Chicago, Maker of Speedometers, Showing New Addition Constructed Recently.

The Federal Motor Truck Company, Detroit, maker of one-ton trucks, has purchased the land, buildings, machinery, etc., of the Van Dyke Motor Car Company, and the former concern will move its machinery into the new plant which it is estimated will increase its production to about 1000 cars a year. In the accompanying illustration is depicted the factory which is 60 by 512 feet. In addition to the buildings shown there are warehouses, test sheds and a power plant. The location favors shipping, being accessible to the Michigan Central, Wabash, Lake Shore and Grand Trunk railways, sidings existing from two of these roads.

The Lauth-Juergens Motor Car Company, Fremont, O., announces the sale of four one-ton and one two-ton trucks to Brink's Express, Los Angeles, Cal., which concern does a general express and transfer business. The following have been appointed agents: The Mutual Auto Company, Duluth, Minn.; A. S. Lascelles & Co., New York City for Australia; P. A. Brink, Los Angeles, Cal.

The States Auto Supply Company has been incorporated at Oskaloosa, Ia., with a capital of $50,000, the officers being as follows: President, D. P. McClure; vice president, C. W. Payne; secretary, A. O. Watland; treasurer, E. P. McClure. This concern will do a wholesale business in motor car accessories, covering the States of Iowa, Minnesota and Missouri, as well as those adjacent to them.

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GAS ANALYSIS INSTRUMENT.

Proper carburetion is one of the most important factors in the operation of an internal combustion engine, and unless the vaporizer be set properly there is a decrease in the efficiency of the power plant as well as trouble developed in the nature of carbon deposits. The common practise of setting a carburetor is to change the amount of fuel and air until the motor appears to run satisfactorily on the mixture and this is done regardless of the proper proportions. It may be that too much gasoline is being employed and that the excess is not being converted into energy. There are certain stated proportions of air and gasoline and these percentages have been determined after years of study and experimentation.

A device for analyzing the gas has been designed by Joseph W. Hays, combustion engineer, is manufactured and marketed by the Combustion Appliances Company, Rogers Park, Chicago, and is known as the Coapco special gas analysis instrument. It is mounted in a steel carrying case, having outside dimensions of 13 inches high, seven wide and less than three thick. It weighs less than 13 pounds and may be carried in any position without spilling the fluids utilized in its construction.

The operation is simple and the gases may be tested in less than a minute. The method of checking these is as follows: A short piece of gas pipe or brass tubing is inserted in the muffler or exhaust member and the instrument suspended. The motor is started and by pressing a bulb connected with the device a sample of gas is drawn in and conveyed to the registering tube, where the amount of carbon dioxide, carbon monoxide, etc., is noted easily. If the mixture be not correct the carburetor is adjusted either for gas or air as the device indicates is necessary. Too much or little of either is noted readily and it is obvious that all guesswork in setting the vaporizer is eliminated.

If it be desired to make a combustion test upon the road, all that is necessary is to tap a cock into the muffler or exhaust pipe and connect the instrument by means of a rubber hose. The former may then be taken into the tonneau and samples taken while the car is in operation and at any speed and over all road conditions and grades. In addition to ensuring a correct mixture the device makes for economy as rich mixtures are instantly detected and considerable time saved in the garage in adjusting new or old carburetors.

ISSUES ANNIVERSARY NUMBER.

The Team Owners' Review, a publication devoted to the teaming, transferring and express trade, and which is published in Pittsburg, Penn., has issued an anniversary number which is neatly printed and handsomely illustrated. It contains information pertinent to the transportation industry.

DEMOUNTABLE RIMS FAVORED.

That there is a growing tendency to fit demountable rims as a part of the regular equipment was noted at the recent shows in New York City. At the Grand Palace exhibit nearly 25 per cent. of the commercial vehicles shown were fitted with this type of rim and many of these were Firestones, made by the Firestone Tire & Rubber Company, Akron, O.

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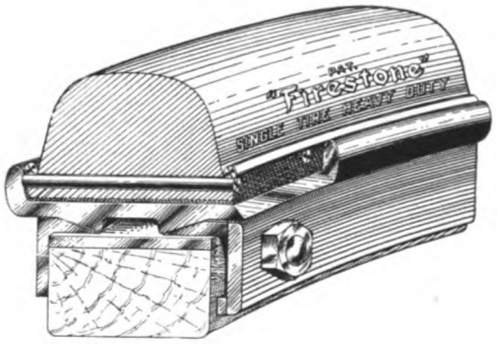
Undisputed Leadership in

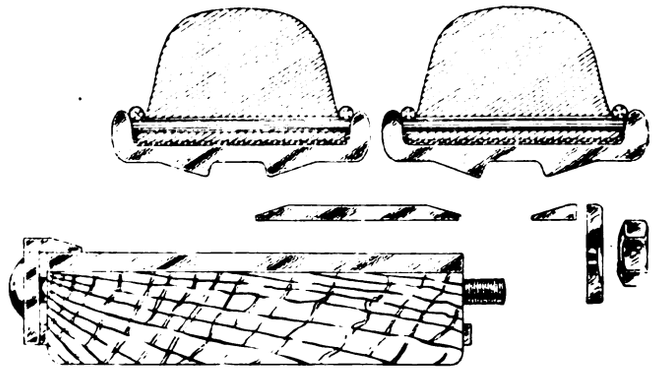
"Firestone"

Leads Again at the Truck Shows

Has More Equipment Than Any Others at the New York Shows, by a wide margin.

A complete line of truck tires for every type of car, size of load and condition of service on Removable and Non-Removable rims. Firestone Truck tires have led the industry from the very beginning in Accuracy of Design, Volume of Output and Quality of Tire. Undisputed leadership has particularly qualified the Firestone company to offer the only complete and fully proven line.





Single and dual Heavy Duty tire for resiliency. Economical in car up-keep. Old and S. A. E. standards. *Note:* Both dual tires can be taken off without removing the wheel.

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The MOTOR TRUCK
Devoted to Motor Driven Business Vehicles of All Classes.

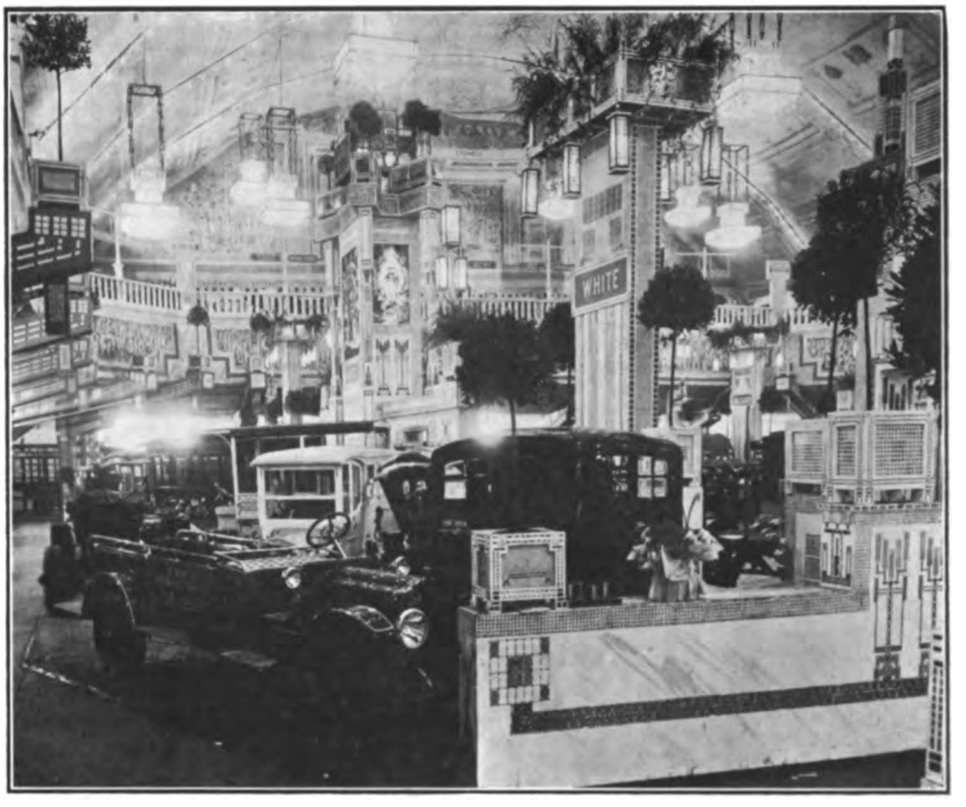
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THIRTY-FOUR NEW MODELS AT CHICAGO.

Many Western Manufacturers Make Initial Showing at This Display---Standard Construction Prevails, Though Novel Designs Are Presented---Attendance Exceeds Last Year.

ASIDE from being the largest exhibition of commercial motor vehicles yet held by the industry the second annual separate showing of industrial transports in the Coliseum and First Regiment Armory at Chicago, Feb. 5-10, was of decided importance. There were 81 different makes on view, of which 74 were gasoline driven machines and seven electric. Thirty-four manufacturers were not represented at the shows in New York during the preceding month, and of these 32 plants are located in the Middle West.

The National Association of Automobile Manufacturers, under whose auspices the event was held, left no stone unturned to make this the most representative showing of motor trucks in the country, and the success of the enterprise was assured by the generous response of the makers. The management, under the direction of S. A. Miles, was not content with providing the opportunity for making display, but carried on a campaign which had its beginning long before the 1911 show, which resulted in greatly augmenting the attendance upon this event.



Scene in the Coliseum During Progress of Chicago's Commercial Car Show, Indicating Beauty of Decorative Scheme.

The plan was in the nature of an educational campaign, in which a systematic correspondence was arranged between the committee in charge and the people of that section of which Chicago is the metropolitan commercial centre. Men in all walks of life were reached by carefully worded letters bringing out the particular benefits to be derived from the use of industrial transports in the line of business with which they were connected. These contained arguments and facts based upon what has been accomplished in different sections of the country, under varied conditions, and the result was in effect a personal invitation to attend the show and study the subject at first hand by comparing the machines on display. That this plan was a success is indicated by the announcement that the total attendance during the week exceeded that during the week in 1911 by 40 per cent. The volume of business transacted was proportionately large. In the matter of decorations, the Chicago show has become recognized as the most elaborately staged of any American automobile exhibition. Of course, this applies to the pleasure car display, since that is held first but the same attractive setting is used for both. This year, the Coliseum proper was so completely transformed that even the show management was at a loss to give the scheme a distinctive name. Accompanying photographs give a slight indication of its remarkable beauty.

A mosaic palace is the term which comes nearest to describing it. The roof was a massive painted arch, from which were suspended three rows of lanterns of square design and great size. Underneath, a wide main aisle divided the show spaces in half, those in turn being sub-divided by superstructures, suggesting immense clock towers surmount-

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ed by small squared spaces with four projecting platforms carrying potted palms. On either side of these clock towers was a lower structure terminating in small turrets, also carrying potted plants.

The treatment of the balcony, where accessories were shown, and the Coliseum Annex, was similar in design but not so elaborate in its execution. The First Regiment Armory utilized some of the decorative features which did duty in the Coliseum last year. All told, the general effect was most bewildering at first.

It has been stated that there were 34 makes of machines on display which were not seen in New York. But one of these was electric. It follows that the electric car situation is not greatly changed as a result of the Chicago show. Reference is had particularly to those vehicles which have been arranged for public inspection in comparison with other makes.

With respect to the gasoline driven machines, it will prove of interest to add those shown at Chicago with those seen in New York and attempt to arrive at some idea of the trend of design. Of course, it will be admitted that this



General View of the Main Floor in Chicago Coliseum, with Motor Trucks Disposed for Inspection.

term is somewhat abused. In the main, motor trucks follow standard construction, much the same as do pleasure vehicles. The day of experimentation is not past, and it will be noted in a continuation of this discussion elsewhere that some new things were brought to light at Chicago.

It will be remembered that there were three worm driven trucks on display in New York. These were the Pierce-Arrow, which adopted this method of final drive a year ago, at the Madison Square Garden exhibit, and the Newark and Rowe at the Grand Central Palace. Chicago added three more—Blair, Great Dain and Smith.

Among the friction driven machines at New York were noted: Cartercar at the Garden, and Best, Commerce and Poss at the Palace. The Great Dain, Service and Utility were added at Chicago.

Accessibility of the power plant has been worked out in a number of ways, as was explained with reference to the eastern displays. At least two more novelties were uncovered at the Coliseum. Two more trucks appeared with the foreign placing of the radiator and the Renault type of hood. Still other features will be noted herein.

Perhaps one of the most notable results of the three shows is the adoption of the foreign policy with respect to the location of the motor elsewhere than under the hood. This may mean that the power plant is under the floor, under the seat, in the cab, or with a hood so short as to prove almost negligible.

Not counting the two three-wheeled vehicles, there were 25 makes of gasoline cars at Madison Square Garden, 32 at Grand Central Palace and 33 at Chicago which were not seen at either of the other two shows. Of the 25 at the Garden 10 were with motors under the hood, 11 under the floor, seat or amidships, and four in the cab. At the Palace, 18 were under the hood, and 14 elsewhere. Of the 33 new trucks at Chicago, 18 were under the hood, 12 under the floor, etc., and three practically within the cab. In one or two cases the hood was so short as almost to bring these makes within the other classifications. This brings the total to 90 different manufacturers, who have decided this question as follows: Under the hood, 46; under the floor, etc., 37; in the cab, seven. It should not be considered, however, that this is an exact representation, since some makers still retain the hood with certain models, having adopted other locations with their newer productions only.

Closely allied with the subject of motor location is that of placing the driver. While the New York show seemed to indicate a tendency toward the left hand drive, so-called, the results at the conclusion of the Chicago display do not seem to warrant this assumption. However, the percentage of trucks thus arranged is sufficiently large to merit attention. Eighteen of the 25 makes shown at the Madison Square Garden were with right hand location of the driver, while seven showed the opposite to be true. At the Grand Central Palace, 18 were at the right and 14 at the left. Of the new makes at Chicago, 24 were the total of 90 again, 60 were with right and nine were left. Taking right hand drive and 30 with left. The same rule applies as with the motor location, since some makers fit vehicles with either right or left hand drive, as desired, although in each such case, the maker has been listed as offering left hand drive in the above compilation. Thus, while the list shows one-third with left hand drive, this is not exactly warranted when the total production is taken into account.

Coming next to the matter of control levers, it will be seen that there exists considerable difference of opinion here as well. Of course, with the left hand placing of the driver, the levers must be taken away from the right side of the truck, although it does not follow necessarily that the levers will be operated with the left hand. When this is not the case, they must be located in the centre, and it is to be noted that some makers have adopted this plan, even though the driver is still retained at the right. The reason, therefore, lies in the opportunity to permit easier ingress and egress to the driver's seat.

Eighteen of the 25 makes seen at Madison Square Garden had the levers at the right, and this number exactly

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Impression Conveyed by Mosaic Palace Effect with Reference to Individual Exhibits.

corresponds with those which had right hand drive. Six had levers at the left, while one had these in the centre. Eighteen of the 32 at the Grand Central Palace also had right hand location of levers, again corresponding with the number of right hand driven machines. Four had levers at the left and 10 in the centre. Of the 33 new makes at Chicago, 22 had levers at the right, one at the left and nine in the centre. In the total of 90, 68 were with right hand control, 11 with left hand, and 20 with central. It will be noted that this accounts for all but one, and that had the control levers mounted on the steering column.

The 82 makers who displayed at Chicago had on view 226 completed vehicles and chassis. Of these 11 cars and six chassis were electric; 209 were gasoline driven, and of these five had one-cylinder engines; 41 two-cylinder; six three-cylinder; 156 four-cylinder, and one six-cylinder. Detailed description of the new models not seen at New York will be found in the succeeding pages.

SAMPSON CARS EFFECT LARGE SAVING.

An instance of economy effected by the use of commercial vehicles in municipal service is noted in Kansas City, where the authorities advertised contracts for six motor trucks about a year ago. After considerable keen competition the award was made to the United States Motor Company, which markets the Sampson cars, made by the Alden Sampson Manufacturing Company, Detroit. Soon afterward three two and three three-ton trucks were placed in service in the street cleaning department.

It was noted by Commissioner W. C. Weaver that each of the machines displaced from seven to nine horse drawn vehicles and that at the end of three months the average cost of maintenance for the six automobiles was $125.25 a month, compared with $960 for the horse drawn equipment, which each of the Sampson vehicles replaced. Figuring at this ratio it was estimated that the motor equipment effected a saving of $5005.50, this amount representing the cost of the cars.

These figures, however, do not comprise depreciation or tire renewals, but even considering these, there would remain a substantial sum in favor of the motor vehicle. The two-ton cars are utilized to gather up cans of street cleanings and to carry and dump the contents at the municipal grounds. In special emergencies, such as at large fires, they are employed to assist the fire department. Frequently the sewer department is aided. Two of the larger vehicles are employed in hauling asphalt, crushed rock, sand and paving materials. They are fitted with a self-dumping body by means of which the driver may dump a three-ton load unassisted in three minutes. The other machine is employed in general street repairs, carrying laborers, tools, material, etc.

VELIE TRUCK ON COUNTRY RUN.

To inaugurate the 1912 commercial car season the Chicago branch of the Velie Motor Vehicle Company, Moline, Ill., sent a three-ton truck loaded with a 1912 Velie speedster to Milwaukee, Wis., a distance of 124 miles. The car left Chicago Sunday, stopping over night at Racine, arriving at its destination the next morning at 10. The trip was made for the purpose of demonstrating the efficiency of the Velie on country roads during the winter. The car averaged 10.2 miles an hour and 4.1 miles to a gallon of fuel. It experienced extreme cold weather and bad roads as well as numerous steep grades. Throughout the test the automobile performed consistently.

WHITE PATROL CAR FOR NEW HAVEN.

After considering carefully the practicability of the motor car for municipal service the police commissioners of New Haven, Conn., have placed an order with the White Company, Cleveland, O., for a patrol wagon. It will be a standard 1500-pound chassis, equipped with a four-cylinder motor of 30 horsepower, and the body will be constructed on the same lines as other White vehicles of this type in service in other cities.



An Alcove Setting in Which the Oriental Design Is Still Further Accentuated.

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New Models Shown at Chicago

OF THE 34 makes of trucks displayed at Chicago, which were not seen at the shows in the East, 33 were gasoline and one electric. Some of these were entirely new, never having been exhibited at any show previously. The following descriptions are intended to present the particular features claimed for each, indicating as well the departures from lines which have been noted heretofore in the older products. The machines exhibited at the New York displays were treated in a similar manner in the issue of MOTOR TRUCK for February.

Adams.

The Adams Bros. Company, Findlay, O., displayed four four-cylinder one-ton Adams trucks. Motor is in front under a Renault type hood, with radiator at the back, following foreign practise. Cylinders are cast en bloc with bore of 3.875 inches and stroke of five. Valves are all on the right side. Cooling is by water, with centrifugal pump and flat vertical tube radiator. Ignition is by Eisemann magneto and storage battery. Lubrication is by splash and force feed. Clutch is a Wells dry disc. Transmission is selective, three speeds forward and reverse. Drive is by double side chain. Service brake on the jackshaft operated by pedal; two emergency brakes on rear wheels, operated by hand lever. Springs are semi-elliptic, front and rear. Wheelbase is 121 inches; tread, 56; tires, 36 by three inches front, and 36 by 3.5 in rear. Chassis weight is 3200 pounds. Driver is at the left with levers in the centre.

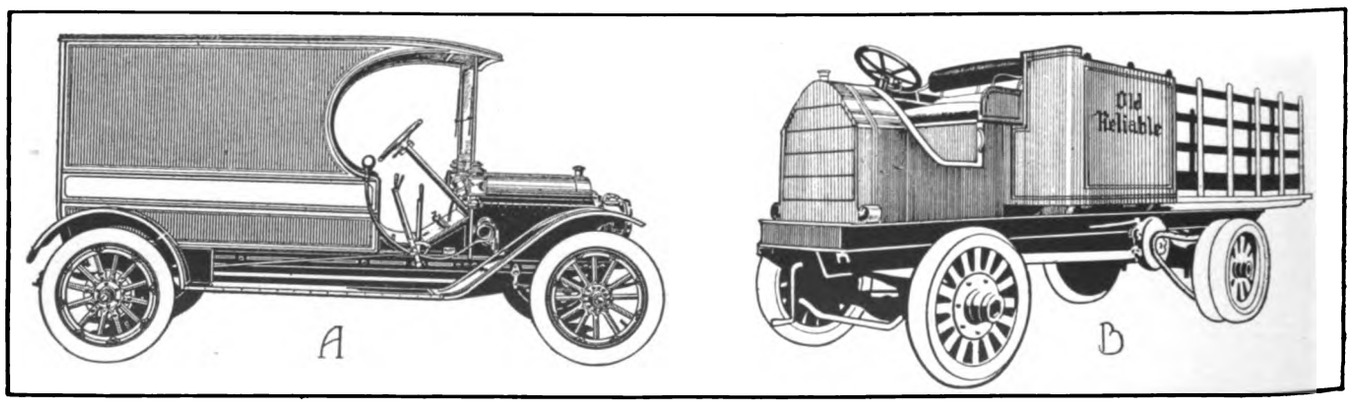
A particular feature of the construction is the mounting of the engine on a sub-frame and the use of a long propeller shaft connecting the change speed mechanism, which is supported in front by a single cross member from one point, and at two points on another cross member at the rear. The jackshaft bearings are bolted to the underside of the frame members. Full accessibility is afforded by lifting the hood from the front. This with the foreign radiator mounting gives the truck a decidedly distinctive appearance. However, it will be seen that for the most part the construction follows standard lines.

Avery.

The Avery Company, Peoria, Ill., exhibited three four-cylinder vehicles of two, three and five tons capacity. With the two and three-ton models, the motor is located under a hood, while the driver and levers are placed at the right and beside the rear portion of the hood. Cylinders are cast separately, with bore of 4.75 inches and stroke of five. Cooling is by water, with centrifugal pump and either honeycomb or vertical tube radiator. Ignition is by storage battery, Eisemann coil and Eisemann dual automatic magneto. Lubrication is by force feed gear pump and splash. Clutch is a multiple disc, 11 large steel discs housed in the flywheel, dust proof and running in oil. Transmission is selective, three speeds forward and reverse. Drive is by double side chains. Service brakes are internal expanding on countershaft, operated by pedal; emergency, internal expanding on rear wheels, operated by hand lever. Springs are semi-elliptic all around. Wheelbase is 140 inches; tread, 62 in front and 68 in rear; tires, solid rubber, 36 by four-inch front and 36 by 3.5, dual, rear, on the two-ton, and 38 by five, front, and 38 by four, dual, rear, on the three-ton. Chassis weight, 5500 pounds for two-ton and 5700 for the three.

In the main the five-ton model does not differ materially from the smaller machines. The motor is of the same size, but is mounted on a sub-frame with three point suspension, the location being under the floor. The transission is made a unit with the jackshaft housing. The driving chains are enclosed in a steel case. The construction throughout necessarily is heavier. While the wheelbase is the same the tread is 62 inches in front and 72 in the rear. Tires are solid, 38 by six inches in front, and 38 by five, dual, rear. Chassis weight is 7250 pounds.

The above specifications may be regarded as standard, although the three-ton vehicle on display was equipped with cast steel rim wheels and wood plug tires, which also are furnished as regular equipment upon order. The net weight of the chassis in this case is 5875 pounds.



Two of the New Models Displayed at Chicago: A, 1500-Pound Dorris Wagon; B, 3.5-Ton Reliable Truck.

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Bessemer.

The Bessemer Motor Truck Company, Grove City, Penn., presented one four-cylinder Bessemer truck, rated at one ton. The motor is in front under a hood, with driver at the left, and central control levers. Cylinders are cast en bloc with bore of 3.75 inches and stroke of 5.25. Cooling is by water. Ignition is by Bosch dual system high-tension magneto. Lubrication is by force feed. Clutch is a cone with cork insert. Transmission is selective, three speeds forward and reverse. Drive is by double side chain. Two sets of brakes are fitted, expanding and contracting on rear wheels. Springs are semi-elliptic in front and platform in rear. Wheelbase is 107 inches, tires, 34 by three inches in front and 34 by 3.5 in the rear.

Power is transmitted through the three speed transmission to a jackshaft bolted to the frame and thence through side chains to the rear wheels. The spring hanger and end of jackshaft housing are integral, permitting the removal of the jackshaft by loosening two bolts and a cap. Particular attention has been paid to the matter of accessibility throughout. An American self-starter is fitted.

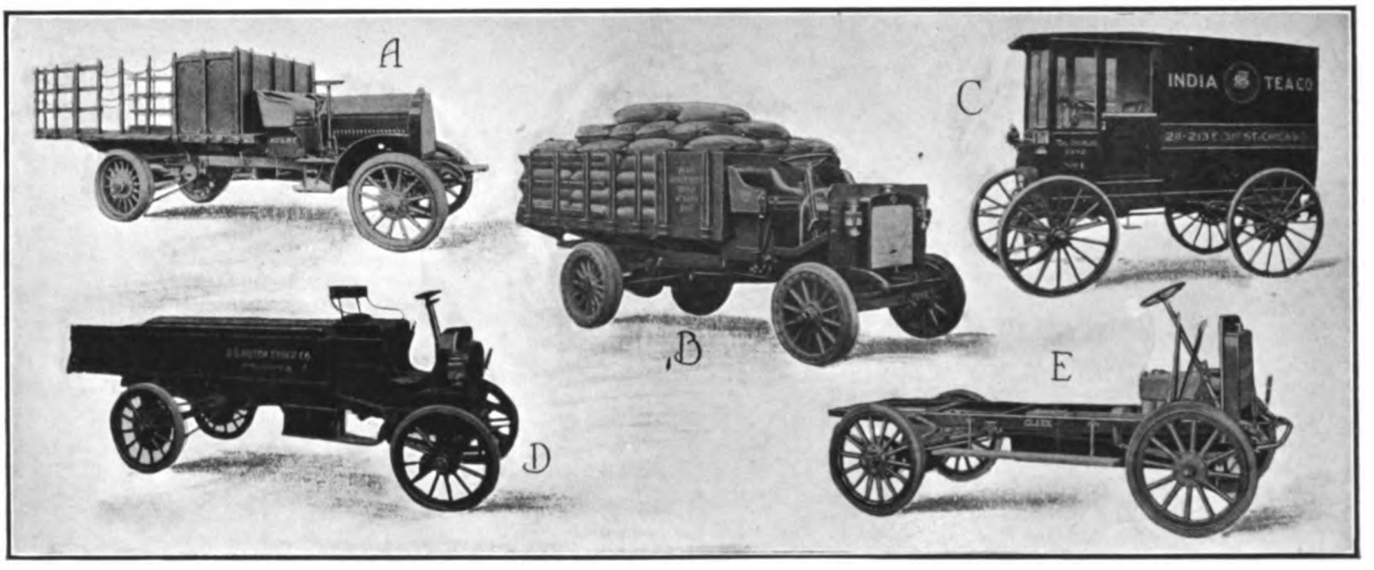
Blair.

The Blair Manufacturing Company, Newark, O., showed three four-cylinder delivery wagons and a chassis, all of one-ton capacity. The motor is under the floor with driver and levers at the right. Cylinders are cast en bloc with bore of 3.75 inches and stroke of five. Cooling is by water, thermo-syphon system with honeycomb radiator. Ignition is Eisemann high-tension magneto. Lubrication is by gear pump. Clutch is a multiple disc, running in oil. Transmission is selective, three speeds forward and reverse. Drive is by shaft. Brakes are double expanding on rear wheels. Springs are semi-elliptic in front and full elliptic with auxiliary coil springs in the rear. Wheelbase is 100 inches; tread, 56; tires, 36 by three inches front and 36 by 3.5 rear. Chassis weight is 3000 pounds.

As special features, it is claimed that the motor is one of the few block designs having three main bearings, which is held to make for rigidity and long life. The motor and transmission are mounted on a sub-frame, and it is only necessary to remove the foot plates to work on any part of the mechanism. A drawbar is provided upon order, by means of which it is possible to utilize the truck as a tractor for hauling other light vehicles.

Diamond T.

The Diamond T Motor Car Company, Chicago, presented one complete four-cylinder wagon and a chassis, both of five



A Group of Chicago Exhibits: A, Two-Ton Avery; B, 1.5-Ton Blair; C, 1000-Pound Mercury; D, One-Ton United States; E, One-Ton Clark.

its one-ton four-cylinder chassis. The motor is under a hood beside the driver, who is located at the right with right hand levers. Cylinders are cast en bloc with bore of 4.125 inches and stroke of 5.25. Cooling is by water with centrifugal pump and square tube honeycomb radiator. Ignition is by Bosch magneto and dry cells. Lubrication is by positive plunger pump and with constant lever. Clutch is a cone with cork inserts. Transmission is selective, three speeds forward and reverse. Drive is by worm gear and no universals. Two sets of brakes are fitted, contracting on rear wheel hubs and propeller shaft drum. Springs are semi-elliptic in front and platform in rear. Wheelbase is 114 inches; tread, 60; tires, 34 by four inches front, 34 by three inches, dual, rear. Chassis weight is 4000 pounds.

As will be noted, this is one of the makes which presents a worm drive this year. The worm has four threads and is of the Hindley type. A 28-degree angle is employed, and there are four separate and distinct bearings. Of these, two on either side are thrust, while the others are annular. The worm is made demountable from the rear by the removal of two holding and two housing bolts.

Clark.

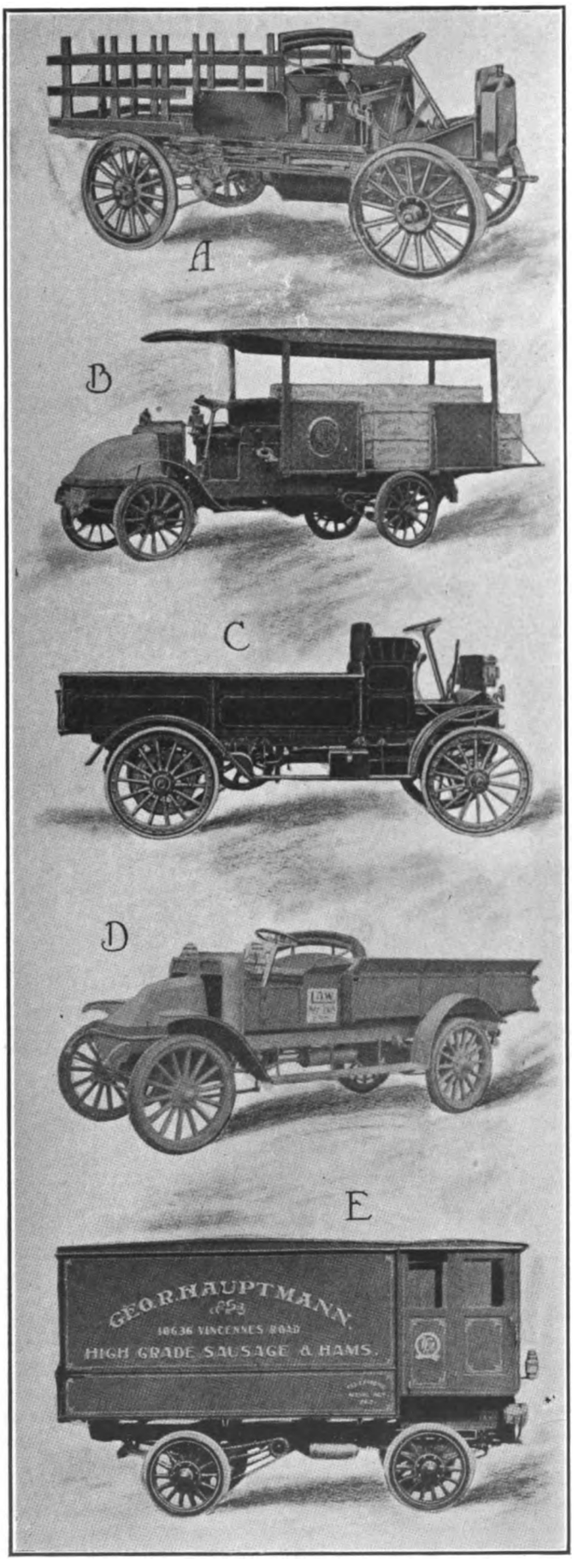
The Clark Delivery Car Company, Chicago, had on view tons capacity, although a three-ton model is produced by the same concern. The motor is in front with driver and levers at the right. In the vehicle shown the cylinders are cast in pairs, with bore of five inches and stroke of 5.5. Cooling is by water. Ignition is by Bosch dual system. Clutch is a multiple disc, steel plates running in an oil tight case. Transmission is selective, three speeds forward and reverse. Drive is by double side chain. Wheelbase is 144 inches; tires, 36 by six, demountable, single in front and dual rear.

The construction is substantial throughout and of simple design, the frame being heavy and well braced at all vital points. The motor is suspended on a sub-frame and heavy plates are set between this and the main frame, acting as brace and pan at the same time. It may be added that the three-ton model carries the same specifications as above, with the exception that the springs are lighter and the tires are 36 by five inches.

Dorris.

The Dorris Motor Car Company, St. Louis, heretofore known as a pleasure car maker, displayed one four-cylinder Dorris 1.5-ton truck and a 1500-pound chassis. The motor is in front under a hood and the driver and levers at the

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Shown at Chicago: A, 1500-Pound Little Giant; B, One-Ton Adams; C, One-Ton Utility; D, 1.5-Ton L. A. W.; E, Two-Ton Harder.

right. Cylinders are cast in pairs with bore of 4.375 inches and stoke of five. Cooling is by water. Ignition is by Bosch magneto and dry cells. Lubrication is by the constant level splash system with gear pump and oil reservoir in the bottom of the crankcase. Clutch is a special Dorris dry plate, multiple disc, housed in the fan flywheel. Transmission is selective, three speeds forward and reverse. Drive is by propeller shaft with double universal joint and straight line drive under load. Brakes are internal expanding and external contracting on rear wheels. Springs are semi-elliptic in front and three point platform in rear. Wheelbase is 132 inches; tread, 56; tires, 35.5 by 4.5 inches, all around.

Several features are noted, among which may be mentioned the fitting of a centrifugal governor, acting on the butterfly valve in the intake pipe, set to limit the speed of the truck to 12 miles an hour. A water jacket placed around the inlet pipe from the carburetor to the branch is connected with the water circulating system and by being kept warm supplies a warm mixture to the motor at all times. Another refinement is the use of a Prest-O-Starter. Mention also may be made of an auxiliary cross spring in the rear, carried under a cross member.

Great Dain.

Joseph Dain, Ottumwa, Ia., brought out a new chassis in the four-cylinder Great Dain of one-ton capacity. The driver is located at the left with centre control. The cylinders are cast en bloc with bore of 3.75 inches and stroke of five. Cooling is by water, with pump and honeycomb radiator. Ignition is by K-W high-tension magneto. Lubrication is by force feed. Clutch is a cone. Transmission is dual friction. Drive is by shaft and full floating worm. Two sets of brakes are fitted, contracting and expanding. Springs are semi-elliptic in front and three-quarter platform in the rear. Wheelbase is 100 inches; tread, 56.5 inches; tires, 36 by 3.5 in front, and 36 by four in rear. Chassis weight is 3000 pounds.

The transmission scheme is of decided interest, inasmuch as the friction discs are employed only for low speed and reverse, the direct drive being through the cone clutch. This whole assembly is made a part of the motor, providing a unit power and transmission plant. In addition, it is claimed for this construction that it provides a perfect three point suspension, power being transmitted at all times directly from the engine to the rear axle in a straight line, no universal joints being used.

The transmission proper consists of two discs set at an angle to each other, which on low speed and reverse are rotated by the rim of the flywheel being brought into frictional contact with their edges. A friction wheel slideably connected with the propeller shaft and mounted between the discs, receives the power from the faces of the discs. When shifting the friction wheel across the faces of the discs, or to disengage the power when using the transmission, the driver may by a simple movement of the foot, lift the friction wheel out of engagement with the discs and thereby release the contact between it and the faces of the discs. The discs being mounted with their faces at an angle to each other, or in other words, the friction wheel being in wedging contact with the faces of the discs, makes it possible to relieve the frictional contact by lifting the friction wheel instead of moving the discs.

To shift from low to high speed, or from transmission to direct drive, the friction wheel, which carries one member of a cone clutch, is moved out of contact with the faces of the discs and into engagement with the other member of the cone clutch formed in the flywheel. Doing this moves the flywheel out of contact with the edges of the discs and leaves them dormant. The power is disengaged when on the direct drive by releasing the clutch with the foot lever.

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With reference to the three point suspension, it may be said that the drive shaft is encased in a tube which has a slip joint near the rear end. The torque is cared for by this tube, and there are means of taking this away from the drive shaft, these being in the nature of buffers located immediately in front of the back axle. The slip joint is designed to prevent any tendency to transmit radial strains through the transmission or motor.

Final drive is by a Hindley full floating worm drive axle, in direct line with the drive shaft and motor. The axle itself is of the semi-floating type, and an auxiliary cross spring is carried on the back cross member, this being braced on either side to the frame member by pressed steel straps, concaved to add strength and rigidity.

Harder.

The Harder Auto Truck Company, Chicago, presented a two-ton stake, three-ton furniture van and a combination chemical fire wagon. In these the motor is located under the floor with driver and levers at the right. The four cylinders are cast in pairs and are of four different sizes—four by four inches, 4.25 by 4.75, 4.75 by five, and five by six. Cooling is by water with vertical tube radiator. Ignition is by Mea magneto. Lubrication is by force feed and splash. Clutch is of special design, comprising 15 cone shaped plates. Transmission is selective, three speeds forward and reverse. Two sets of brakes are provided, internal and external. Wheelbase is 110 inches; tread, 58; tires, 32 by four in front and 34 by five in rear.

Several special features are noted. The radiator is hinged on the left side, and uncoupling two hose connections makes it possible to swing this member as in opening a door. The power plant is then fully accessible for adjustment or removal. The spring system also is unusual. The front members are of the semi-elliptic type but of special construction. The rear suspension is of the platform type, also special, and instead of a cross spring at the rear there is what is termed an equalizing traction bar. This is swivelled in the centre of the frame with the ends hung on spring shackles, so that the tendency is for the floor of the truck to remain horizontal even when one wheel drops into a hole.

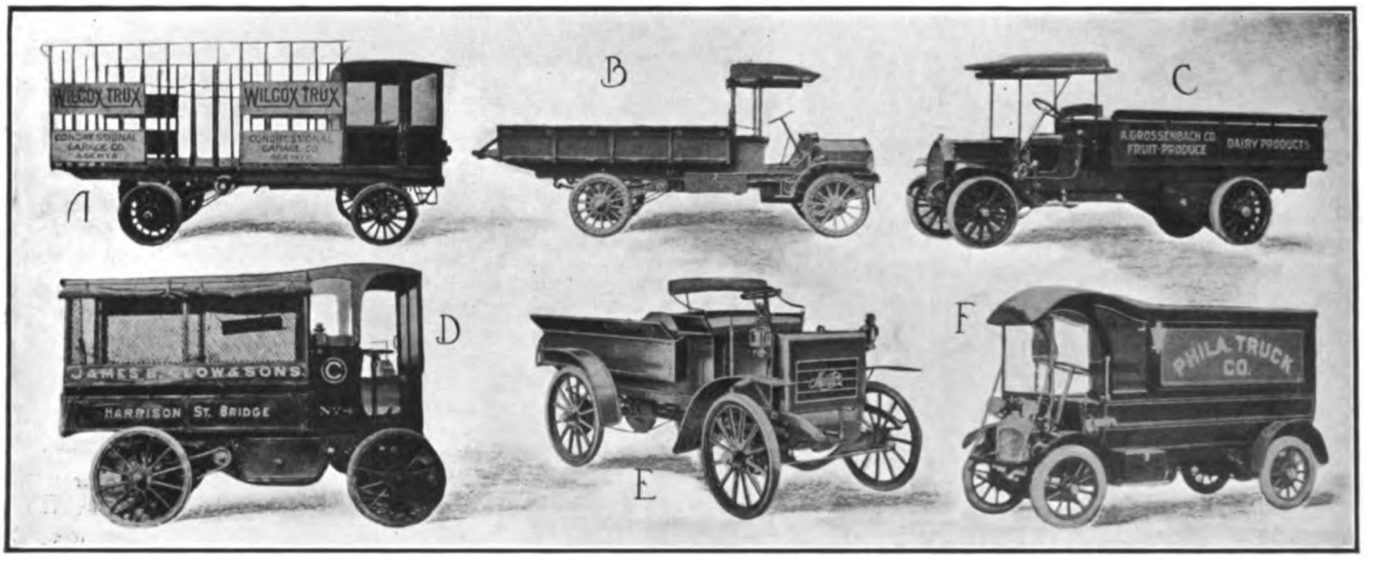
Indiana.

The Harwood-Barley Manufacturing Company, Marion, Ind., displayed one one-ton four-cylinder Indiana truck. The motor is in front under a hood, with driver at the right and centre control. The cylinders are cast singly, with bore and stroke of four inches. Cooling is by water, with gear pump and flat tube radiator. Ignition is by Bosch magneto. Lubrication is by the splash and pump system. Clutch is a multiple disc. Transmission is selective, three speeds forward and reverse. Drive is by side chains. Service brake is on the jackshaft, and emergency on the rear wheels. Springs are semi-elliptic all around. Wheelbase is 120 inches; tread, 58; tires, 34 by three in front, and 34 by four in rear. Chassis weight is 2850 pounds.

Although a new design, it will be noted that this product does not depart greatly from accepted standard construction. The maker is prepared to furnish all types of special bodies upon order, although the regular equipment is an express wagon with carrying space four feet two inches in width and five feet 9.5 inches in platform length.

International.

The International Harvester Company of America, Chicago, exhibited three of its two-cylinder International auto wagons. The motor is located amidships with driver and levers at the right. The cylinders are opposed, with bore and stroke of five inches. Cooling is by air, with fans at the sides of the cylinders driven by belts from the flywheel. Ignition is by Heinze magneto and battery. Lubrication is by a 10-feed mechanical oiler. Clutch is of the expanding band type. Transmission is planetary, with two speeds and reverse. Drive is by chains. Service brake is on the differential and emergency on the rear wheels. Springs are full elliptic all around. Wheels are of the buggy type.



Six Additional New Models: A, Three-Ton Wilcox; B, 1.5-Ton Indiana; C, Two-Ton Stegeman; D, One-Ton Schmidt; E, 1500-Pound Monitor; F, 1500-Pound Philadelphia.

Jeffery.

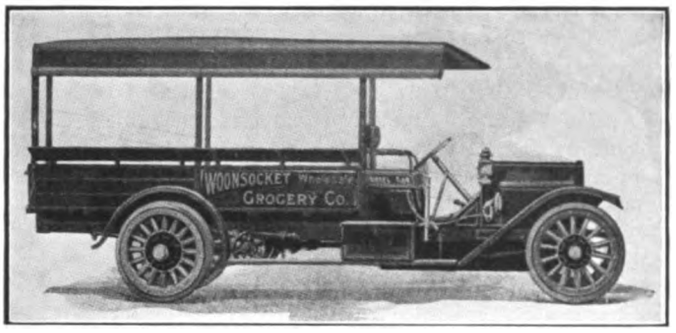
Although the Thomas B. Jeffery Company, Kenosha, Wis., is well known as the maker of Rambler pleasure cars, its trucks have been named Jeffery. One four-cylinder 1.5-ton vehicle was shown. The motor is under the seat, with driver at the left and central control levers. Cylinders are vertical and the horsepower rating is 38. Cooling is by water. Ignition is by Bosch high-tension magneto. Lubrication is by combination force feed and splash. Transmission provides three speeds forward and reverse. Drive is by side chains. Service brake is on the jackshaft and emergency on the rear wheels. Springs are semi-elliptic all around. Wheelbase is 120 inches; tires, 34 by four in front, and 34 by three, dual, rear.

KisselKar.

One of the most complete lines displayed was the KisselKar, made by the Kissel Motor Car Company, Hartford, Wis. This included the 1500-pound, one, two, three and five-ton

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models. In these the four-cylinder motor is located in front under a hood, with driver and levers at the right. In the smaller vehicles the bore is 4.5 inches and stroke, 4.75, while in the three and five-ton models the bore is 4.875 and



Two-Ton KisselKar Truck at Chicago Display.

the stroke five. Cooling is by water, with centrifugal pump, square tube radiator and belt driven fan. Ignition is either by Mea or Bosch magneto. Lubrication is by splash. Clutch is a leather faced cone, with adjustable spring inserts underneath the leather, permitting gradual engagement. Transmission is selective, four speeds forward and reverse. Drive is by chains. Service brakes are contracting on countershaft; emergency, internal expanding on rear wheels. Four semi-elliptic springs are employed.

In the two-ton vehicles the wheelbase is 140 inches; tread, 60; tires, 34 by four, front, and 36 by 3.5, dual, rear. Chassis is 18 feet over all and weighs 4450 pounds. In the three-ton, wheelbase is 144 inches; tread, 68; tires, 36 by four, front, and the same size, dual, rear. Chassis is 19 feet four inches, and weighs 5300 pounds. In the five-ton, the wheelbase is 156 inches; tread, 69; tires, 36 by five, front, and 40 by six, dual, rear. Chassis is 20 feet six inches, and weighs 6000 pounds.

The maker of this line claims there is a KisselKar truck or delivery wagon designed to give the lowest cost service, whether it be wanted for hauling heavy freightage, fast delivery of lighter merchandise, or for long or short hauls. Reserve capacity, reserve power and reserve structural strength are held to give the widest latitude of service. In addition it is stated that the excess ability is not gained at the sacrifice of low fuel cost, for in competition the KisselKar has demonstrated its ability to master all road conditions under excess loads at from 15 to 20 per cent. less fuel consumption than others.

L. A. W.

The L. A. W. Motor Truck Company, Findlay, O., showed one four-cylinder 1.5-ton truck. The motor is in front under a Renault type hood, and driver either at the right or left with central control levers. The cylinders are cast en bloc with bore of 3.75 inches and stroke of five. Cooling is by water, thermo-syphon system, with radiator behind the motor in front of the dash. Ignition is by Eisemann magneto. Lubrication is by force feed through a hollow crankshaft. Clutch is a multiple disc, dry. Transmission is selective, three forward speeds and reverse. Brakes are external and internal. Springs are semi-elliptic all around. Wheelbase is 130 inches; tread, 58; tires, 38 by 3.5 front, and 40 by four in rear. Chassis weight is 4000 pounds.

A special feature is the final drive scheme, wherein the drive is through spur gears first, thence through the conventional bevel gear mechanism to the rear wheels. This is done to obtain the gear reduction without enlarging the differential housing. The Renault type hood and foreign radiator placing puts the L. A. W. in the distinctive class.

Little Giant.

The Chicago Pneumatic Tool Company, displayed three two-cylinder vehicles and a chassis, rated at one ton each. The motor is located under the seat with driver and levers at the right. The cylinders are opposed with five-inch bore and four-inch stroke. Cooling is by water, thermo-syphon system, with flat vertical tube radiator. Ignition is by Splitdorf magneto. Lubrication is by plunger system. Clutch is a multiple disc. Transmission is planetary, two speeds forward and reverse. Drive is by side chains. Brakes are internal expanding and external contracting on rear wheel hubs. Springs are three-quarter elliptic in front and full elliptic in rear. Wheelbase is 91 inches; tread, 56; tires, 36 by two in front, and 36 by 2.5 in rear. Chassis weight is 2035 pounds.

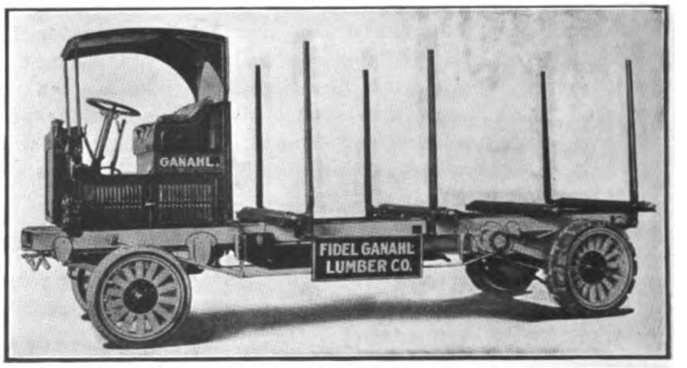
Mercury.

The Mercury Manufacturing Company, Chicago, presented three two-cylinder Mercury vehicles of 1000 pounds capacity. The motor is under the seat with driver and single control lever at the right. The cylinders are horizontal opposed, with bore of 4.25 inches and stroke of four. Cooling is by air. Ignition is by jump spark, dry cells and storage battery. Lubrication is by force feed and splash. Clutch is a single disc. Transmission is planetary, two speeds forward and reverse. Brakes are internal expanding. Springs are full elliptic, front and rear. Wheelbase is 85 inches; tread, 56; tires, 38 by 1.75 inches in front and 40 by 1.75 inches in rear. Wheels are of the buggy type. Chassis weight is 1500 pounds.

Mogul.

The Mogul Motor Truck Company, Chicago, showed two four-cylinder Mogul vehicles. One was a six-ton lumber truck and the other a two-ton stake wagon. Motor is under the floor and driver and levers at the right. Describing the larger vehicle first: The cylinders are cast in pairs with 5.25-inch bore and 5.75-inch stroke. Cooling is by water, centrifugal pump, adjustable radiator fan and honeycomb radiator. Ignition is by high-tension magneto. Lubrication is by splash. Clutch is a multiple disc, alternate discs made of bronze and steel, running in an oil tight housing. Transmission is progressive, three speeds forward and reverse. Two sets of equalizing brakes are located on the rear hubs, both internal expanding. Springs are semi-elliptic, front and rear. Wheelbase is 155 inches; tread, 60.5; tires, 36 by seven inches in front and 40 by six, dual, in rear.

The two-ton model has cylinders cast en bloc, with bore of 4.125 inches and stroke of 5.25. Transmission is selective, three speeds forward and reverse. Service brakes are mounted on the jackshaft; emergency on the rear



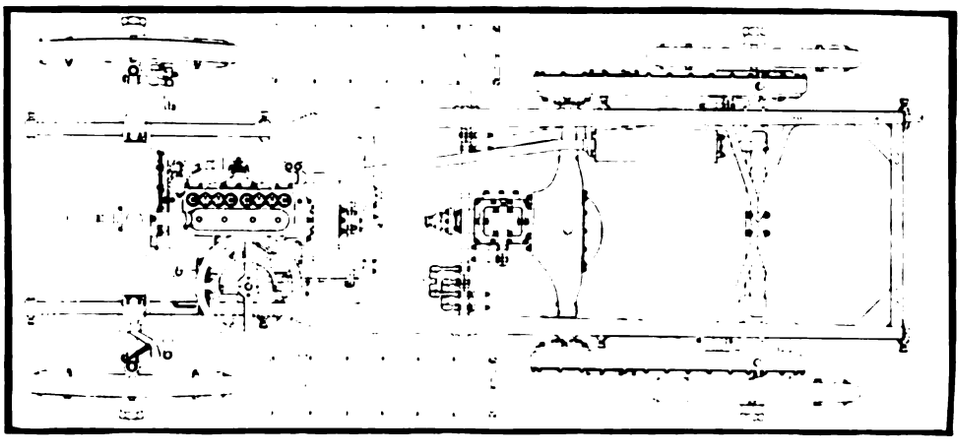
Six-Ton Mogul with Special Lumber Body.

wheels. Wheelbase is 118 inches; tires, 44 by three inches in front, and 52 by three in rear. In other respects it is similar to the larger machine.

The lumber truck is designed to fulfill the particular

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requirements of this industry. It is equipped with a patented roller bed device by means of which an entire load may be taken on or unloaded in a few minutes, without disturbing the piling. A hand operated winch moves the rollers so that the work may be accomplished easily by one man.



Chassis of the One-Ton Natco Wagon, Presenting the Relation of the Parts.

Monitor.

The Monitor Automobile Works, Janesville, Wis., displayed two two-cylinder Monitor vehicles and two chassis, all of 1500 pounds capacity. The motor is located under the floor with driver and single control lever at the right. The cylinders are opposed with bore of five inches and stroke of four. Cooling is by water, thermo-syphon system, with cellular radiator. Ignition is by Remy magneto and dry cells. Lubrication is by mechanical oiler. Clutch is a cone. Transmission is planetary, two speeds forward and reverse. Drive is by shaft. Brakes are internal and external on rear wheels. Springs are semi-elliptic in front and full elliptic in rear. Wheelbase is 100 inches; tread, 56 inches; tires, 33 by 2.5 inches in front and 34 by three in rear. Chassis weight is 2200 pounds.

Natco.

The National Motor Truck Company, Bay City, Mich., now calls its product the Natco, and was represented by one four-cylinder truck and a chassis, both of one-ton capacity. The motor is under a hood and driver at the left with central control levers. Cylinders are cast en bloc with bore of 3.5 inches and stroke of five. Cooling is by water, thermo-syphon system, with vertical tube radiator. Ignition is by high-tension magneto. Lubrication is by force feed. Clutch is a leather faced cone, supported by compression springs. Brakes are double, internal set in rear hubs. Springs are semi-elliptic, front and rear. Wheelbase is 104 inches; tread, 56; tires, 36 by 3.5, front and rear. Chassis weight is 2400 pounds.

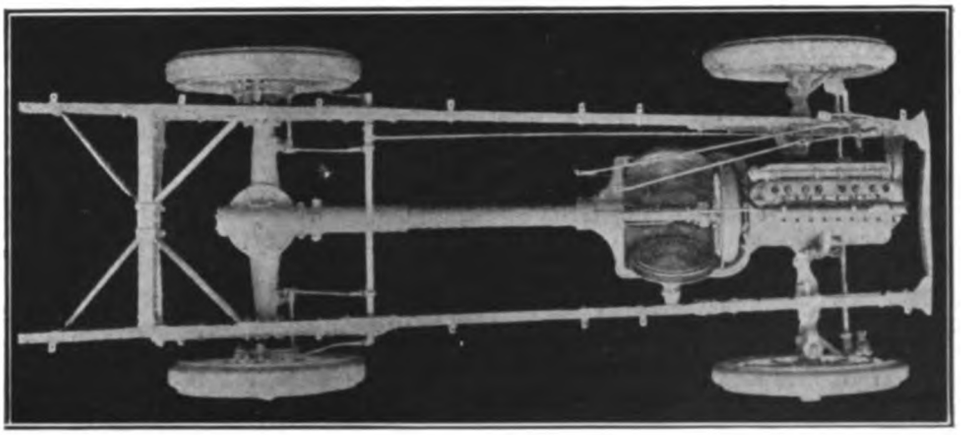
The motor is supported on a sub-frame and is so located that the driver's seat is brought up to the rear of the hood, which is very short, giving the appearance of a motor-under-the-floor location. When the bonnet is raised, the entire mechanism is exposed. The jackshaft is of the full floating type, the housing being attached to the underside of the frame. Final drive is by double side chains, which are encased and run in an oil bath. An auxiliary spring is carried under a double cross member in the rear, this converging at the centre and supplying an additional brace.

A particular feature is the method of lubrication, in which the oil is filtered through water. The main reservoir of six quarts capacity is attached to the bottom of the engine case, and the pumps, which are gear driven by camshaft, are located in a compartment at the forward end of the motor. The oil is forced from the pumps to the end bearings, through the crankshaft to the connecting rod pins. The excess returns to the main supply tank through the standpipe, which extends to within .375 inch of the bottom of the water compartment, and owing to the difference in specific gravity between water and oil, the latter rises to the top of the water and overflows into the main reservoir. During the passage of the lubricant through the water, carbon which is collected by the oil while performing its lubricating function, is precipitated to the bottom of the water compartment, which can be cleansed thoroughly at certain intervals. In addition to the clarifying of the oil, it also is cooled. Lubricant in the forward pipe line flows through the sight feed on the dash.

Old Reliable.

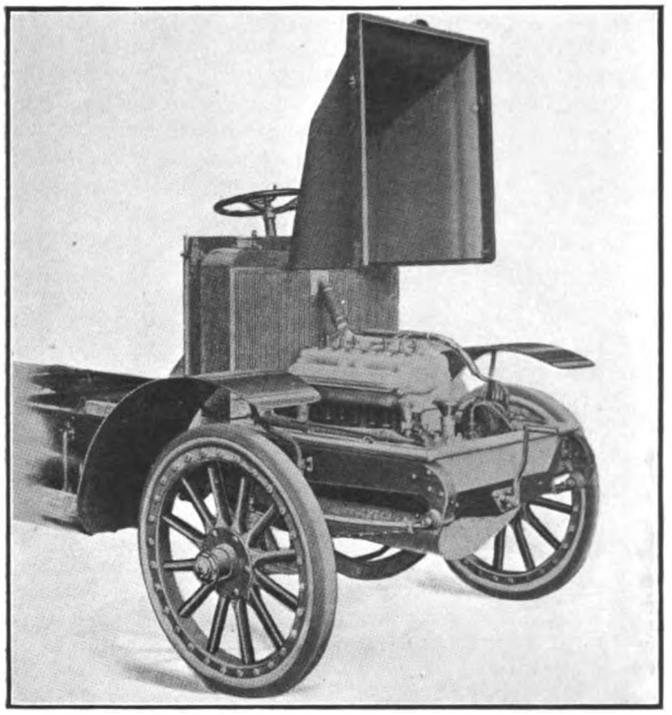
The Henry Lee Power Company, Chicago, showed one four-cylinder Old Reliable 3.5-ton truck and chassis of the same capacity. The motor is located under the floor, with driver and levers at the right. Cylinders have a bore of 4.75 inches and stroke of 5.5. Cooling is by water. Ignition is by a double system. Lubrication is by a self-contained system. Clutch is a multiple disc. Transmission is selective.

Although rated at 3.5 tons, it is said that five tons have been handled on this vehicle with satisfactory results. The motor is carried on a sub-frame, and so arranged that it may be accessible readily by the removal of the radiator, which is supported on trunnions, and the bolted bumper cross member. In addition to the support given the transmission through the jackshaft housing, the forward end of the transmission case is bolted to a heavy cross member that is securely braced with gussets. Back of the jackshaft and immediately over the rear axle is another cross member. The special features claimed for the truck are its complete accessibility and its sturdy construction throughout for both the chassis and the bodies.



Great Dane One-Ton Chassis, Employing Novel Friction Transmission and So-Called Perfect Three Point Suspension.

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Indicating Accessibility of Adams Power Plant, and Foreign Radiator Mounting.

Philadelphia.

The Philadelphia Truck Company, Philadelphia, showed one four-cylinder 1500-pound wagon. The motor is located under the floor with driver at the left and central control levers. Cylinders are cast in pairs with bore of 3.625 inches and stroke of 4.25. Cooling is by water, with centrifugal pump and honeycomb radiator. Ignition is by storage battery. Lubrication is by force feed. Clutch is a dry disc, Raybestos faced. Transmission is selective, three speeds forward and reverse. Drive is by shaft. Two sets of brakes are fitted, both internal expanding. Springs are semi-elliptic in front and three-quarter elliptic in rear. Wheelbase is 112 inches; tread, 56; tires, 34 by four, all around. Chassis weight is 2100 pounds.

The motor is a new model of the Peru line, seen for the first time at the pleasure car show in Chicago. It is supported at three points on the main frame, and is of unit construction, including an E. E. electric self-starter as an integral part. This means that the combined motor-generator of the starting system takes the usual place of the flywheel, the functions of the latter being performed by the field of the generator.

Premier.

The Premier Motor Manufacturing Company, Indianapolis, Ind., well known as maker of the Premier pleasure line, displayed its new Premier truck of 1.5 tons capacity. The motor is the same as that employed on the "4-40" cars, but the construction of the chassis frame has been materially strengthened throughout. This is particularly true of the rear axle, although it is of the same design as that of the pleasure cars. Dual pneumatic tires were shown, but solids are offered as an option. Semi-elliptic springs, front and rear, replace the three-quarter elliptic members of the pleasure line.

Sandusky.

The Sandusky Auto Parts & Motor Truck Company, Sandusky, O., presented two four-cylinder 1.5-ton vehicles. The motor is located under the floor with driver and levers at the left. Cylinders are cast en bloc with bore of 3.75 inches and stroke of five. Cooling is by water, with centrifugal pump and vertical tube radiator. Ignition is by Mea magneto. Lubrication is by the constant level splash system. Clutch is a cone. Transmission is selective, three speeds forward and reverse. Brakes are double expanding, both in rear hubs. Springs are semi-elliptic in front and three-quarter platform in rear. Wheelbase is 106 inches; tread, 56; tires, 40 by 3.5 inches solid or 36 by five pneumatic, front and rear.

Accessibility of the power plant is afforded by mounting on a sub-frame, which can be withdrawn bodily from the chassis. The removal is accomplished by simply withdrawing six spring controlled plungers, raising the steering column and operating two levers that release the sub-frame and drop it down onto rollers. The assembly then may be withdrawn much the same as pulling out a drawer. The radiator and fuel tank are connected to the power plant in such manner that the removal may be made without breaking water, fuel or electric connections.

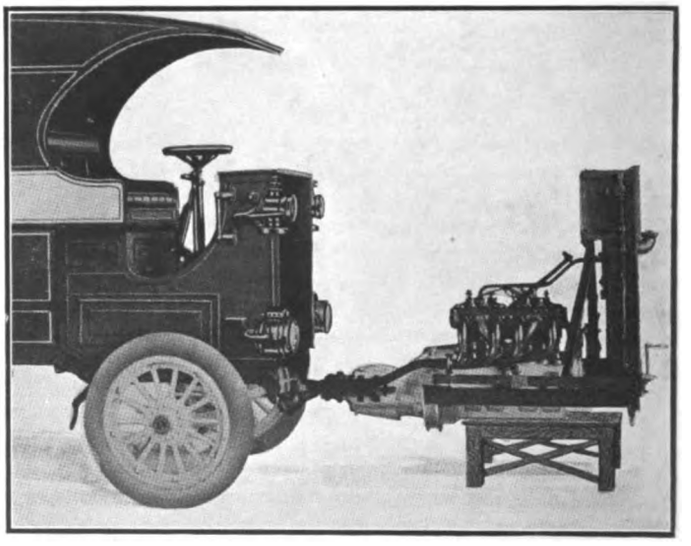
Schmidt.

The Schmidt Bros. Company, Chicago, showed two two-cylinder vehicles of half-ton and one-ton capacity and a chassis. The motor is located amidships and the driver at the right. The single lever for high speed is attached to the steering post, leaving the front of the car remarkably free. Cylinders are opposed. Cooling is by air. Ignition is by magneto. Lubrication is by force feed and splash. Transmission is planetary, two speeds forward and reverse. Drive is by roller chain. Brakes are internal expanding. Springs are quarter-elliptic in front and coil in rear. Wheelbase is 92 inches, and tires, 38 by 2.5 inches on the one-ton model, and 80 inches and 38 by two inches, respectively, on the half-ton.

Service.

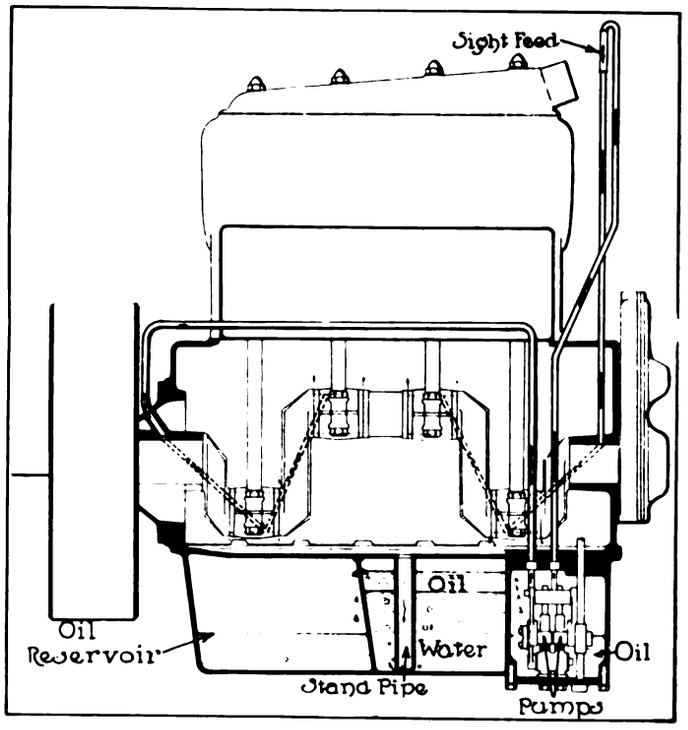
The Service Motor Car Company, Wabash, Ind., presented one four-cylinder one-ton Service wagon and a chassis. The cylinders have a bore of 3.75 inches and stroke of 5.25. Cooling is by water. Ignition is by magneto. Transmission is friction. Drive is by chain. Springs are semi-elliptic all around. Large, solid tires are fitted.

It may be stated that the chief feature of the Service line is the double friction disc transmission scheme, in which this unit is supported by an overhead yoke, and two cross members support the bearings of the driven discs. The shifting device is attached to the overhead yoke, with a long rod reaching to the operating lever beside the driver. The two driven discs are operated by means of a pedal and are held against the driven discs by heavy springs, and a tightener in case the load pull exceeds the holding ability of the springs.



Illustrating Method of Removing Power Plant, Radiator and Fuel Tank on Sandusky Truck.

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Lubrication System Employed on Nuteo Vehicles, by Which Oil Is Clarified and Cooled.

Another novelty in connection with the exhibit was the fitting of a pulley at the back of the frame, to which a belt may be applied for use in driving agricultural implements, etc. This is operated by means of a shaft from the back driving pulley, and is supported by means of bearings attached to the frame at the back.

Smith.

The A. O. Smith Company, Milwaukee, Wis., displayed one four-cylinder five-ton Smith truck. The motor is located in front under a hood with driver and levers at the right. The cylinders have a bore of 4.5 inches and stroke of 5.5. Cooling is by water. Ignition is by Bosch magneto. Clutch is a cone. Transmission is the Cotta system, with gears always in mesh. Drive is by worm.

There is very little about this vehicle that is conventional in design. The frame is of seven-inch section, pressed with a beaded channel and concave surface. The cross members are of the overhead yoke type, serving also to carry the spring hangers. Even the seats are of steel, as are also the dash and all other parts.

The transmission and rear system are a unit, and are so designed that there is absolutely a straight line to the worm drive. The transmission housing has an enlargement at the forward end, designed to be bolted to the ball and socket joint attached to the cross member. On the top is a lifting ring, and the construction is such that the entire transmission may be removed without disturbing a single gear.

The drive shaft extends through the large torsion tube and is connected to the worm, which is of the Lanchester design. The latter is so mounted that it may be removed by taking out the rear flange bolt, thus permitting the displacement of the entire housing.

Staver.

The Staver Carriage Company, Chicago, presented one four-cylinder ambulance. As is well known, this company has been producing pleasure cars for some years, and the vehicle displayed does not depart greatly from the design of these, except in the heavier construction. The same 40 horsepower motor is employed, and the body is fitted with all the modern appliances in connection with the work it is designed to perform.

Stegeman.

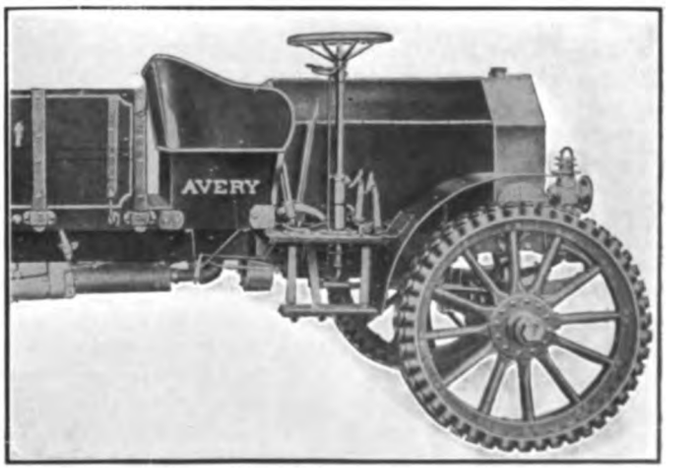
The Stegeman Motor Car Company, Milwaukee, Wis., displayed two four-cylinder Stegeman vehicles and a chassis. The motor is located in front under a hood, and driver at the left with central control levers. Two models were shown, the two and the six-ton. Cylinders have a bore of 4.125 inches and stroke of 5.25 in the former, and 4.5 by 5.5 in the latter. Cooling is by water, with centrifugal pump and vertical flat tube radiator. Ignition is by automatically timed magneto. Lubrication is by force feed and splash. Clutch is a multiple disc, dry plate. Transmission is selective, three speeds forward and reverse. Service brake is external contracting on propeller shaft; emergency internal expanding on rear wheels. Springs are semi-elliptic, front and rear. Wheelbase is 125 inches on the smaller and 145 on the larger. Tread is 60 and 78, respectively. Tires on the two-ton model are 34 by four in front and 36 by three, dual, in the rear. On the larger, these members are 36 by six in front, and 40 by six, dual, in rear. Chassis weight is 4000 pounds for the smaller and 7000 pounds for the larger.

Sternberg.

The Sternberg Manufacturing Company, Milwaukee, Wis., showed one four-cylinder four-ton chassis. Cylinders are cast in pairs, with bore of five inches and stroke of 6.5. Cooling is by water, with gear pump and flat tube radiator. Ignition is by Eisemann magneto and storage battery. Lubrication is by self-contained oiling system. Clutch is a Hele-Shaw. Transmission is selective, three speeds forward and reverse. Drive is by chains. Brakes are on jackshafts and rear wheels. Springs are semi-elliptic all around, with auxiliary spring in the rear. Wheelbase is 144 inches; tread, 70; tires, 36 by five, single in front and dual, rear. Chassis weight is 7000 pounds.

United States.

The United States Motor Truck Company, Cincinnati, O., displayed a four-cylinder, four-ton truck and chassis. Cylinders are cast in pairs, with bore of 4.5 inches and stroke of 5.5. Cooling is by water, with centrifugal pump and vertical tube radiator. Ignition is by Bosch dual magneto. Lubrication is by gear pump. Clutch is an internal cone. Transmission is selective, three speeds forward and reverse. Drive is by side chains. Brakes are on jackshaft and rear wheels. Springs are semi-elliptic front and rear, with auxiliary cross springs in the rear. Wheelbase is 114 inches; tread, 62 inches in front, 64 in rear; tires, 34 by five inches in front, 36 by five, dual, in rear. Chassis weight is 5800 pounds.



Illustrating Seat Location and Wood Plug Tires on Avery Truck.

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Utility.

The Stephenson Motor Car Company, Milwaukee, Wis., control of which is said to have passed to the J. I. Case Threshing Machine Company, Racine, Wis., presented its four-cylinder one and three-ton trucks, now known under the name of Utility. The motor is under the floor, and driver at the right with the levers in the centre. Cylinders are cast in pairs, with bore of 4.75 inches and stroke of five inches on the smaller vehicle and 4.25-inch bore and five-inch stroke on the larger. Cooling is by water, with centrifugal pump and vertical tube radiator. Ignition is by Eisemann magneto. Lubrication is self-contained within the crankcase. Transmission is double friction. Drive is by double chain. Brakes are expanding members. Springs are semi-elliptic in front and three-quarter platform in rear. Wheelbase is 134 inches; tread, 60; tires, 42 by five inches, all around.

The friction transmission is distinctive, being of the Stephenson design. A long propeller shaft connects the motor and one driving disc, the latter being supported on a cross member. The other driving disc also is supported by a cross member, and the driven discs are carried on a jackshaft, which in turn carries the sprockets transmitting the power to the rear wheels by chains.

Whitesides.

The Whitesides Commercial Car Company, New Castle, Ind., displayed one four-cylinder 1500-pound truck. The motor is in front under a hood with driver and levers at the right. Cylinders are cast en bloc, with bore of 4.125 inches and stroke of 4.5. Cooling is by water, thermo-syphon system. Ignition is by Splitdorf magneto and dry cells. Lubrication is self-contained. Transmission is planetary, two speeds forward and reverse. Drive is by double side chains. Brakes are internal expanding on rear wheel hubs. Springs are full elliptic, front and rear. Wheelbase is 118 inches; tires, 34 by 2.5 inches.

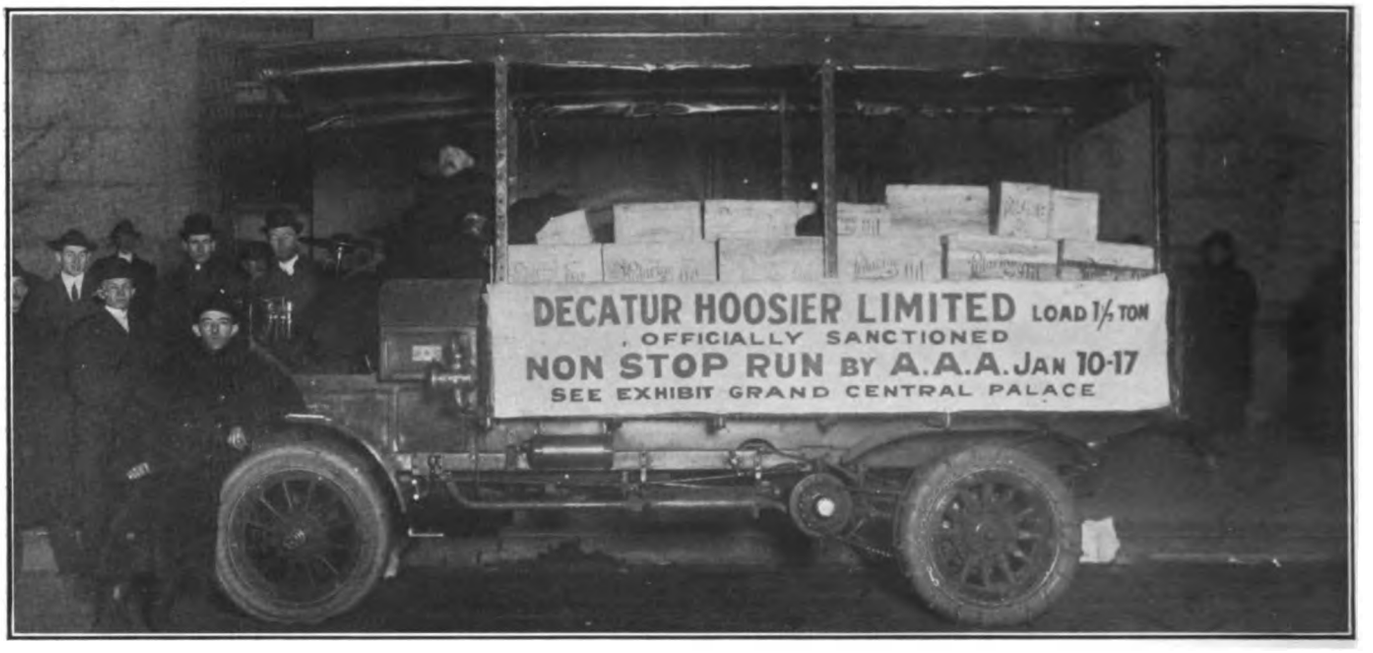
A feature of the construction is the use of kiln dried white oak, reinforced by steel armor for the frame. These members are held in place with heavy wood screws, frequently placed and staggered. The cross members also are armored wood, held in place by means of iron gusset plates. These latter are not right angle braces, but extend across the corners.

Wilcox.

The H. E. Wilcox Motor Car Company, Minneapolis, Minn., showed one four-cylinder three-ton truck and a chassis. The motor is in the cab, with driver and levers at the right. Cylinders are cast in pairs, with bore of 4.25 inches and stroke of 4.5. Cooling is by water. Ignition is by Bosch high-tension magneto. Lubrication is by gear driven pump. Clutch is a cone. Transmission is selective, three speeds forward and reverse. Drive is by side chains. Two sets of brakes are fitted, service on the jackshaft and emergency on the rear wheels, both internal expanding. Springs are full elliptic in front and three-quarter platform in rear. Wheelbase is 126 inches; tread, 62; tires, 36 by four inches in front, 36 by 3.5, dual, rear. Chassis weight is 5500 pounds.

DECATUR TRUCK IN SEVERE TEST.

To demonstrate the practicability of the commercial automobile a 1.5-ton Decatur truck, made by the Decatur Motor Car Company of Decatur, Ind., recently participated in a seven-day non-stop run. The event was sanctioned by the American Automobile Association and official observers accompanied the machine. The headquarters for the car was at the Flatow Flinn Company's service depot, 147 West 37th street, New York City, distributor for the Decatur product.



Decatur 1.5-Ton Mechanical Transport Which Participated in a Non-Stop Run Recently, and Which Carried a Consignment of Polarine Oil from Boston to New York.

The power wagon carried a maximum load of Polarine oil during its trial and the trips consisted of routes leading out of New York, including runs into Connecticut territory. Previous to the trials the truck was driven from Boston to New York City carrying a load of Polarine oil consigned to the Standard Oil Company of the latter city. During the test snow storms and extreme cold weather were encountered.

The use of the electric commercial vehicle is growing in favor in Boston and sales are reported weekly. Among those recorded recently was a five-ton coal truck to the Metropolitan Coal Company and a 3.5-ton General Vehicle, made by the General Vehicle Company, Long Island City, N. Y., to the New England Confectionery Company.

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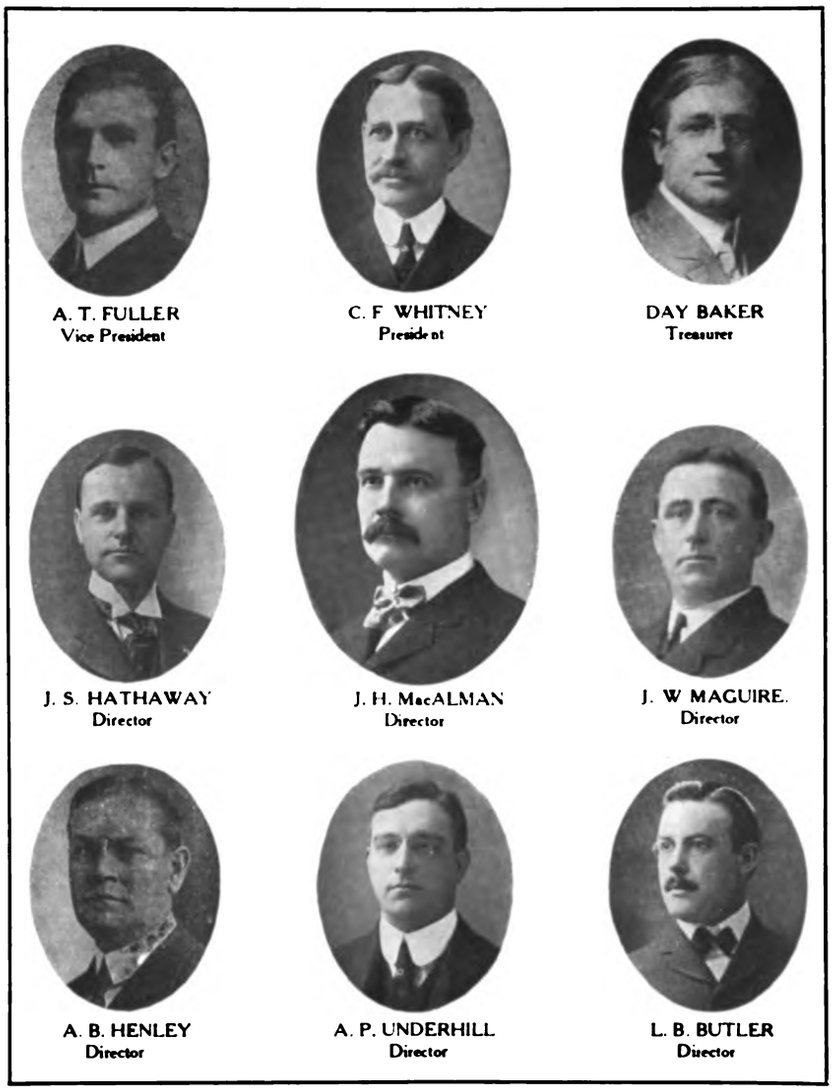
BOSTON'S MAMMOTH MOTOR TRUCK SHOW.

Exhibition Will Be the Largest Ever Held Under One Roof in America and Its Displays Will Be the Most Complete and Satisfactory of the Year.

THE first exclusive show of service wagons to be held in Boston will be opened in Mechanics' Building, Huntington avenue, the evening of March 13 and will be concluded the evening of March 20, this giving the same length of time for this exhibition that has been devoted to the display of pleasure vehicles in previous years. This policy is in keeping with those of the managements of the shows at New York and Chicago, where the industrial wagons were shown separately from those devoted to pleasure and professional use.

This will be the first exhibition at Boston where the displays will be divided, although for six years there has been a division given over to showing of vehicles created for industrial use. In previous years the wagons and trucks have been subordinated to the pleasure machines and have been located in the basement where they could not possibly receive the attention directed toward the more prominent exhibits on the first floor.

No criticism can be made of the policy of previous years because until within a matter of 18 months there was little realization of the possibilities of the service wagon market, and a year ago the conditions were such that a division of the two classes of exhibits could not well be made. The show will be made by the Boston Commercial Motor Vehicle Association, under the direction of Chester I. Campbell, and while it will be practically a continuation of the exposition of the Boston Automobile Dealers' Association, it will have separate existence.



Officials of the Boston Commercial Motor Vehicle Association.

The possibilities for business in this show are fully realized by the members of the organization conducting it, and it may be said that, as has been the experience with Boston exhibitions, it will be the largest and most productive of the national expositions of the year. There is every reason why this result should obtain. The eastern market is the richest of the world. This has been amply proven in the utilization of the pleasure car and with the power wagon. The conditions are unlike those existing elsewhere and there are innumerable influences that impel the use of the truck or wagon in every phase of industry and commerce.

Considered from every viewpoint the market is superior to all others. The best demonstration of this is the history of the automobile trade. The people have the motor knowledge that is essential to successful utilization of the power wagon in business. It is not necessary to engage in educational campaigns or missionary work to establish the value of the power vehicle as compared with existing methods of transportation. The reliability and endurance of the service wagon is acknowledged and with a majority of the people, at least, the principal question to be determined is the manner of adapting the machines to the methods the vogue, or changing the systems for haulage, both receiving and delivering to the better utilization of mechanical transports.

Why the automobile wagon has decided advantages need not be discussed. First of all there are more commercial centres than in any other section of the country, some of them comparatively short distances apart, each of which draws to it business of material proportions. No one municipality monopolizes the trade. The many lines of communication preclude this. There are the finest systems of highways in America with main thoroughfares generally connecting these cities and towns, by which delivery may be made at long distances. These roads mean quicker and more economical delivery than is possible in other parts of the nation. They mean the longer endurance of the vehicle and the minimum of operating expense. They mean the expansion of business of the individual, firm or corporation proportionate to the facilities for delivery, and while a maximum of 20 miles daily for a horse would mean a radius of less than 10 miles, the truck or wagon may be driven several times this distance in less time and haul a load several times larger.

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There is no uncertainty as to the work that may be accomplished by the service wagon. There is no doubt as to its practical utility, and the main question is how shall the method of doing the work now done be changed so that it may bring either of two results—the lessening of the expense for what is now accomplished, or so increasing the field for business that it may be materially developed. It is not to be expected that the first may be so planned that it cannot be improved upon, and the second cannot be realized immediately; there must be creation of the demand through the purchasing advantages offered to the people.

There are differing elements entering into the market that must also be considered by those who are selling service wagons. One of these is the character of competition to be met with, but it is evident that where the largest volume of business may be obtained there are those who are striving to secure whatever proportion of it their vehicles will specially serve. Where there is no business there is no activity and no rivalry among the distributors, if there be even representation.

In the cities of proportions, where the business interests are large, the service wagon has been adopted in surprising numbers. This does not mean by large enterprises only, but by every interest that may be named, employing from the smallest to the largest vehicles and using them for equally varying work. Those who have turned to the newer method of haulage have found that business has followed the expedition of delivery. Economy of time to the purchaser is quite as necessary as to the seller, and the value of purchasing where goods are stocked and can be sent out without delay is apparent.

There is no longer need for the business man to fear complications from the possible failure of a service wagon. Every endeavor has been directed toward producing what is reliable and will endure, and the representatives have also made provision for supplying whatever may be needed for restoration and replacement in the event of wear. Some of the manufacturers have even gone further and provided their own service stations for the express purpose of maintaining the vehicles they build, and some of these are fitted so as to give every attention that could be found in a garage as well as the expert attention that is expected from those who specialize care and upkeep of the machines they sell. These are extremely large in some instances, the structures built purposely for the requirements of such service, and with equipment and facilities to do everything that might be desired. In fact some of these establishments are even more than factories, because they combine every de-



Mechanics' Building, Where the Boston Motor Truck Show Will Take Place.

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partment of a factory as well as the accommodations and the service of the garage.

These conditions make apparent to the man who is considering the adoption of the service wagon that he will have to deal with entirely different situations than did those who first began mechanical haulage, and that he will not have to work out results blindly, for he has available the experience of those who have given the subject the closest study and have dealt with it from every angle and aspect. The market was never so promising, because there are innumerable reasons why the saving in handling of material or commodities is decidedly economical. Where it is practical to do so the motor truck or wagon has been used instead of the railroad for short hauls, this being due to obvious economy as well as the saving of time, besides the elimination of the possibility of damage.

Considering the Boston exhibition as it has been thus far arranged for: It will be fully as large as both the metropolitan shows, so far as number of makes of cars displayed is concerned, and it will closely approach, if not equal, the Chicago show. There is a total exhibition area in Mechanics' Building of 105,000 square feet, all of which has been given over to the displays of trucks, wagons, accessories and supplies. The decorations as arranged for the pleasure car exhibition will not be removed and the machines will be shown in one of the most pleasing settings created this season. As striking as were the other national expositions it is declared by Manager Campbell that the Boston show will be superior to them all in point of attractiveness.



Chester I. Campbell, Manager Boston Automobile Show.

The list of service wagon exhibitors has not been revised and it is expected that it will be considerably augmented before the opening of the show. As the facts are now known there will be a total of 61 different makes of service vehicles, which will be displayed generally by the local representatives or the branches of the makers. It is probable that this number will be increased to 70 at least. The proportions of the show may be the better understood when it is known that at Madison Square Garden in January, 37 different makes were shown, and at Grand Central Palace 33 different makes, making a total of 70 for both. At the Chicago exposition 82 different productions were on display. In 1911 there were 35 makes shown at Madison Square Garden and 57 were seen at Chicago. Taking the figures as stated it will be seen that Boston will have an exhibition that will far exceed all others save that at Chicago last month, and there is a prospect it will equal that.

In considering the known exhibitors it will be found that of the 61, 22 manufacture both pleasure cars and service wagons, while 39 are engaged exclusively in production of the commercial type. Last year 20 makes were of the first named category and 21 of the second. Of the exhibitors of 1911, 13 will make no display at Boston this season, and of these five manufacture service wagons exclusively and the remaining eight produce both types of vehicle.

Of the exhibitors who will be seen this year, 28 made exhibition a year ago and there will be 33 who did not show machines in 1911, which is a sufficient indication of what will be new to Bostonians and the thousands of visitors who will visit the big exhibition. So far as the show is concerned there will be, exclusive of the makes seen in 1911, 33 different makes of vehicles which, while possibly not unknown, will be decidedly interesting to all. There will be unusual opportunity for the examination and comparison of the different exhibits, while there will be display and demonstration of the body equipment that has been developed during the past year to meet the demands of the different owners.

As there is much dependent upon the special form of body installations that can be made, and a material factor in truck service is the special or general work that can be done by it, there will be a degree of attention directed toward the bodies that will equal that given to the chassis. While some of the machines have been shown at other large exhibitions they will be in every way new to Boston, and their advantages will be expatiated by those who will have them in change.

It is needless to specify that the show will introduce some features that are distinctly new. These will be found in the chassis, the bodies, and in the equipment installed upon them. It is probable there will be much to interest in the application of self-starting devices, although these have not as yet been given serious consideration by any large percentage of the manufacturers of service wagons. There is quite as much demand, however, for the installation of starters as with the pleasure machines. Besides this there will be distinct progression manifested in the details of construction as compared with the show of a year since. Many of these have been written of and described, but they will assuredly be interesting to those who have taken up the study of the problem of vehicular transportation.

In connection with the show there will be a number of demonstrations made for the purpose of establishing facts for the special benefit of those who will visit the exhibition. These will vary decidedly and it is not improbable that some will be made with a view of showing more than one capacity or quality. Naturally they will be given as much prominence as is consistent with the undertakings. There will not be so much attention to "stunts" as to practical utilizations, which will serve to inform and guide those making investigation or inquiry.

One of the best indications of the concern in the service wagon and the possibilities through its use is that there will be visits made the show by organizations of commercial character, especially for the purpose of learning systematically from those regarded as authorities facts that have material bearing. For instance, the New England Coal Dealers' Association, a body that has a membership of something like 1500 men, will visit the exhibition, this being the result of the association taking up the subject of transportation.

Undoubtedly this opportunity for the representatives of the manufacturers coming into contact with so many business men cannot be otherwise than mutually beneficial. Obviously it has been the very satisfactory result from practical service that has created this interest.

The exhibition of accessories and supplies will be largely continued through the power wagon show. While it is true that primarily many of the articles have been created and produced for pleasure car equipment and use, it is also a fact that these may be used in many instances with service wagons, and with interest of the visitors to the truck exhibition often directed toward two types of vehicle instead of one there is abundant reason to expect these will receive a deal of attention.

The following is the list of exhibitors, which is subject to revision, there doubtless being additions at opening time.

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CLASSIFIED EXHIBITORS AT BOSTON AUTOMOBILE SHOW.

GASOLINE COMMERCIAL CARS.

(Second Week.)

110-111 Alco—American Locomotive Company, 591 Boylston street, Boston.

132-133 Atterbury—Atterbury Motor Truck Company, Buffalo, N. Y.

34-37 Autocar — Autocar Company, 642 Beacon street, Boston.

251 Bessemer — Bessemer Motor Truck Company, Grove City, Penn.

38 Buick—Buick Motor Company, Motor Mart, Boston.

148 Cameron — Standard Motor Truck Company, 9 Harcourt street, Boston.

339, 346 Chase—Chase Motor Truck Company, Syracuse, N. Y.

141 Clark—Edward S. Clark, 242 Freeport street, Dorchester, Mass.

222-224 Commer—Dodge Motor Vehicle Company, Lansdowne street, Cambridge, Mass.

149 Commerce — Curtis - Hawkins Company, 162 Columbus avenue, Boston.

17 Dayton—Whitten-Gilmore Company, 907 Boylston street, Boston.

102-103 Decatur—Decatur Motor Car Company, 20 Green street, Cambridge, Mass.

134, 150 De Dion—Boston Motor Company, 1002 Boylston street, Boston.

10 Eckhart—Eckhart Motor Truck Company, 116 Milk street, Boston.

13 Federal — Whitten - Gilmore Company, 907 Boylston street, Boston.

124 Ford—Ford Motor Company, 147 Columbus avenue, Boston.

26-27 Garford — Garford Company, Elyria, O.

105-109 G. M. C.—General Motors Truck Co., 944 Massachusetts avenue, Boston, and Butler Motor Truck Company, 1022 Commonwealth avenue, Boston.

226-227 Grabowsky—Lewis S. McCreary, 183 Pleasant street, Boston.

15 Gramm—Whitney-Barney Company, 823 Boylston street, Boston.

114 International — International Harvester Company of America, 43 Somerville avenue, Somerville, Mass.

100-101 Kelly—Eastern Motor Truck Company, Shoe & Leather building, Cambridge, Mass.

129-130 KisselKar—KisselKar New England Branch, Motor Mart, Boston.

8, 12 Knox—Underhill Company, 885 Boylston street, Boston.

151-152 Koehler—L. E. Schlotterback Manufacturing Company, East Orange, N. J.

135 Lauth-Juergens — Lauth-Juergens Motor Car Company, Lima, O.

15 Lippard - Stewart — Whitney-Barney Company, 823 Boylston street, Boston.

5 Locomobile—Locomobile Company of America, 700 Commonwealth avenue, Boston.

19 Lozier—Lozier Motor Company, 646 Beacon street, Boston.

228-235 Mack—Mack Motor Truck Company, 201 Pleasant street, Boston.

329-330 Mais—R. L. & H. H. Smith, 1008 Commonwealth avenue, Boston.

147 McIntyre — Standard Motor Truck Company, 9 Harcourt street, Boston.

32 Mercury—Mercury Manufacturing Company, Chicago, Ill.

21 Morgan—Morgan Motor Truck Company, Worcester, Mass.

24-25, 28-29 Motor Wagon—Boston Motor Wagon Company, Motor Mart, Boston.

1-2 Packard—Alvan T. Fuller, 1089 Commonwealth avenue, Boston.

14, 18 Peerless—Peerless Motor Car Company of New England, 660 Beacon street, Boston.

312-313 Philadelphia — Philadelphia Truck Company, Philadelphia.

16, 20 Pierce-Arrow—J. W. Maguire Company, 745 Boylston street, Boston.

318-320 Pope-Hartford—Dodge Motor Vehicle Company, Lansdowne street, Cambridge, Mass.

31 Poss — Poss Motor Company, Detroit.

118-120 Reo—Linscott Motor Company, 163 Columbus avenue, Boston.

332-335 Sandusky — Sandusky Auto Parts & Motor Truck Company, Sandusky, O.

22 Sanford—Sanford-Herbert Company, Syracuse, N. Y.

115-117 Sampson — United Motor Boston Company, 100 Massachusetts avenue, Boston.

254-256 Saurer—Mack Motor Truck Company, 201 Pleasant street, Boston.

142-144 Speedwell — Curtis-Hawkins Company, 162 Columbus avenue, Boston.

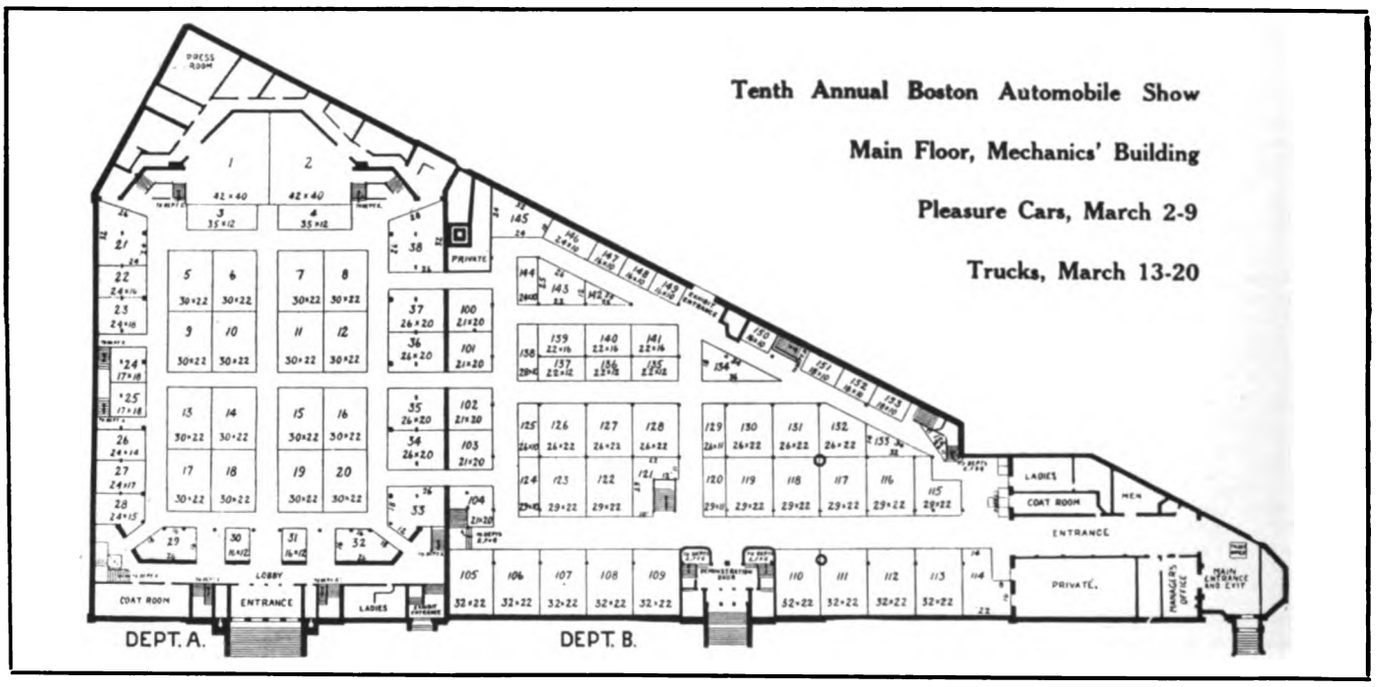
6 Stearns—J. H. MacAlman, 96 Massachusetts avenue, Boston.

237 Sternberg—Hanson Bros., 95 Commercial street, Boston.

112 Teel-Woodworth — Teel Manufacturing Company, Main street, Medford, Mass.

113 Universal — Universal Motor Truck Company, Detroit.

145-146 Velie—Velie Boston Branch, 92 Massachusetts avenue, Boston.



326-327 Victor—Victor Motor Car Company, 75 Haverhill street, Boston.

30 Westfield — Westfield Motor Truck Company, Westfield, Mass.

4, 7, 11 White—White Company, 320 Newbury street, Boston.

ELECTRIC COMMERCIAL CARS.

(Second Week.)

137-139 Baker—Frank N. Phelps, 17 Harvard street, Boston.

121 Couple-Gear—W. E. Eldridge, 178 Devonshire street, Boston.

136 Detroit—Anderson Electric Car Company, Detroit.

122-123 General Vehicle — General Vehicle Company, 84 State street, Boston.

105-109 G. M. C.—General Motors Truck Company, 944 Massachusetts avenue, Boston.

127 Lansden — Lansden Company, Newark, N. J.

126 Walker—Walker Vehicle Company, 131 State street, Boston.

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STEAM COMMERCIAL CARS.
(Second Week.)

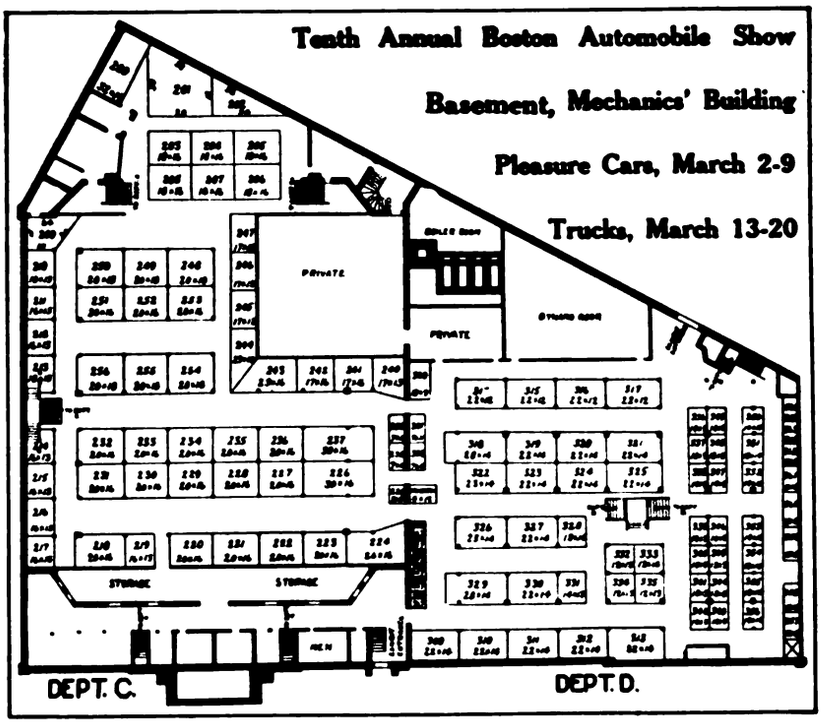
23 **Stanley** — Stanley Motor Carriage Company, Newton, Mass.

IGNITION EQUIPMENT.

614* **American Storage Battery Company**, Albro street, Cambridge, Mass., batteries.
514* **Apple Electric Company**, Dayton, O., batteries.
616-617* **Bi-Motor Equipment Company**, 177 Portland street, Boston, Salom batteries.
242* **G. C. Blickensderfer Company**, Stamford, Conn., spark plugs.
408-409* **Burn-Boston Battery & Manufacturing Company**, 9 Doane street, Boston, batteries.
414* **Champion Ignition Company**, Flint, Mich., magnetos, plugs.
504* **Connecticut Telephone & Electric Company**, Meriden, Conn., Connecticut magnetos, etc.
619* **Smalley Daniels**, Motor Mart, Boston, Kingston magnetos, etc.
415* **Detroit Electric Appliance Company**, Detroit, batteries.
500* **Edison Storage Battery Company**, 895 Boylston street, Boston, batteries.
546-547 **Electric Storage Battery Company**, Philadelphia, batteries.
620* **Walter J. Forbes**, 243 Columbus avenue, Boston, magnetos, plugs, etc.
531* **Heinze Electric Company**, Lowell, Mass., Heinze magnetos.
...* **Holt & Beebee**, 40 Sudbury street, Boston, electric supplies.
618 **Holtzer-Cabot Electric Company**, Brookline, Mass., magnetos, etc.
...* **C. S. Knowles**, 7 Arch street, Boston, spark plugs.
417* **W. H. Leland & Co.**, Worcester, Mass., coils, etc.
553* **Mac-Kae Manufacturing Company**, 185 Armory street, Jamaica Plain, Boston, Mac-Kae spark plugs.
508 **Marburg Bros., Inc.**, New York City, Mea magnetos.
441-442* **Chas. E. Miller**, 202-204 Columbus avenue, Boston, magnetos, plugs, etc.
435* **A. R. Mosler & Co.**, New York City, spark plugs.
336* **Narragansett Chemical Company**, Providence, R. I., batteries.
540* **National Carbon Company**, Cleveland, O., batteries.
509* **National Coil Company**, Lansing, Mich., National magnetos, etc.
421* **Pittsfield Spark Coil Company**, Dalton, Mass., Pittsfield magnetos, etc.
543 **Remy Electric Company**, Anderson, Ind., Remy magnetos, etc.
601* **T. F. Russell & Co.**, 176 Federal street, Boston, magnetos, etc.
548-549 **C. F. Splitdorf, Inc.**, Motor Mart, Boston, Splitdorf magnetos, etc.
521 **U. S. Light & Heating Company**, New York City, batteries.
509* **Vesta Accumulator Company**, Chicago, batteries.

TIRES, RIMS, ETC.

519-520 **Ajax-Grieb Rubber Company**, 15 Park square, Boston, Ajax tires.
516* **Allen Auto Specialty Company**, New York City, cases, pressure gauges, etc.
355 **Atlas Chain Company**, Brooklyn N. Y., chains.
513* **Auburn Auto Pump Company**, 537 Tremont street, Boston, pumps, compressors.
581* **Batavia Rubber Company**, Batavia, N. Y., Batavia tires.
429A* **Booth Demountable Rim Company**, Detroit, Booth rims.
610* **Boston Auto Gauge Company**, 8 Waltham street, Boston, gauges.
609* **Boston Tire & Rubber Company**, 182 Friend street, Boston, tires.
449* **F. Shirley Boyd**, 903 Boylston street, Boston, Dorian rims.
625* **Century Tire Company**, 817 Boylston street, Boston, tires.
350 **Clayton Air Compressor Works**, 200 Devonshire street, Boston, compressors.
619* **Smalley Daniels**, Motor Mart, Boston, Detroit rims.
433 **Diamond Rubber Company**, 867 Boylston street, Boston, Diamond tires.
562* **Dorian Demountable Rim Company**, New York City, Dorian rims.
431 **Empire Tire Company**, 119 Summer street, Boston, Empire tires.
410* **Endurance Tire & Rubber Company**, New York City, Endurance tubes.
550-551 **Federal Rubber Manufacturing Company**, Milwaukee, Wis., Federal tires.
506, 527 **Firestone Tire & Rubber Company**, 145 Columbus avenue, Boston, Firestone tires and rims.
538 **Fisk Rubber Company**, 811 Boylston street, Boston, Fisk tires and rims.
606* **Jas. L. Gibney & Bro.**, Philadelphia, Gibney tires, etc.
541-542 **B. F. Goodrich Company**, 581 Boylston street, Boston, Goodrich tires.
544-545 **Goodyear Tire & Rubber Company**, 669 Boylston street, Boston, Goodyear tires, etc.
446* **Hopewell Bros.**, 29 Chapel street, Newton, Mass., cases.
526-527 **Kelly-Springfield Tire Company**, 683 Boylston street, Boston, Kelly-Springfield tires.
517 **Leather Tire Goods Company**, Niagara Falls, N. Y., Woodworth treads, etc.
602-603 **Lee Tire & Rubber Company**, Conshohocken, Penn., Lee tires.



Boylston street, Boston, Michelin tires and rims.
407* **John Lewis Morse**, Franklin, Mass., Brown inner tubes.
535-536 **Motz Tire & Rubber Company**, Akron, O., Motz tires.
552* **National Rubber Company**, St. Louis, Mo., Tirenew preservative.
439 **Pennsylvania Rubber Company**, Jeannette, Penn., Pennsylvania tires.
424* **Republic Rubber Company**, 735 Boylston street, Boston, Republic tires.
503* **C. A. Shaler & Co.**, Waupun, Wis., Shaler vulcanizers.
452* **Shawmut Tire Company**, 103 Bedford street, Boston, Shawmut tires.
343* **Standard Tire Protector Company**, Akron, O., tire protectors.
402-403* **Standard Tire & Rubber Company**, 104 Portland street, Boston, tires.
523-524 **Swinehart Tire & Rubber Company**, Akron, O., Swinehart tires.
304* **William L. Tobey**, 9 Lewis street, East Boston, Mass., tire tools.
532-533 **United Rim Company**, Akron, O., Standard Universal rims.
436-437 **United States Tire Company**, 863 Boylston street, Boston, United States, Hartford, Continental, G & J and Morgan & Wright tires.
430* **Voorhees Rubber Manufacturing Company**, 34 Columbus avenue, Boston, tires, etc.
501* **Weed Chain Tire Grip Company**, New York City, Weed chains.

LUBRICANTS, POLISHES, ETC.

300* **Baume's Castorine Company**, Rome, N. Y., soaps and polishes.
423 **Borne, Scrymser Company**, 36 Central wharf, Boston, Colonial oils.
440 **Columbia Lubricants Company of New York**, 116 Broad street, New York City, Monogram oils.
515* **Adam Cook's Sons**, 709 Washington street, Boston Albany grease.

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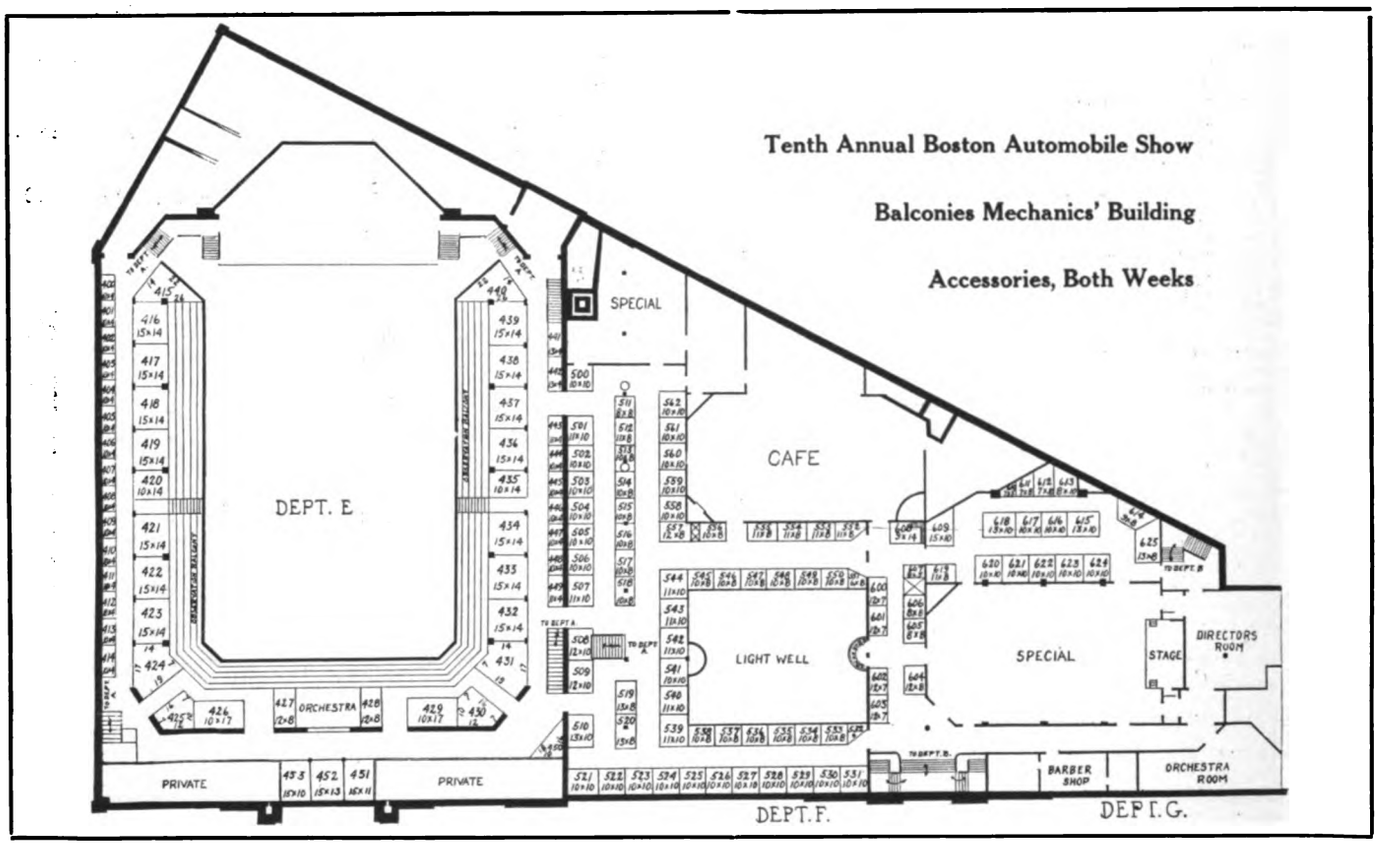
500AA* **L. M. Crane & Co.,** 91 Oliver street, Boston, oils.
308* **Crowell Chemical Company,** Beverly, Mass., Oxford polishes.
518* **Joseph Dixon Crucible Company,** John Hancock building, Boston, Dixon's graphite lubricants.
443 **Eagle Oil & Supply Company,** 104 Broad street, Boston, Eagleine No-Karbon oils.
510 **A. W. Harris Oil Company,** Providence, R. I., Harris oils.
512* **Havoline Oil Company,** 35 Central wharf, Boston, Havoline oils.
502* **George A. Haws,** 889 Boylston street, Boston, Panhard oils.
247* **R. M. Hollingshead Company,** Camden, N. J., Whiz polishes.
446* **Hopewell Bros.,** 29 Chapel street, Newton, Mass., Paos soap.
300 **Ideal Oil Tank & Pump Company,** 146 Summer street, Boston, Ideal storage systems.
534 **International Acheson Graphite Company,** Niagara Falls, N. Y., Acheson graphite lubricants.
613* **International Metal Polish Company,** Indianapolis, Ind., Blue Ribbon polishes.
427* **Chas. F. Kellom & Co.,** 284 Columbus avenue, Boston, Invader oils.
413 **Keystone Lubricating Company,** 184 Franklin street, Boston, Keystone oils.
441-442* **Chas. E. Miller,** 202-204 Columbus avenue, Boston, Miller's Pan-American oils.
336* **Narragansett Chemical Company,** Providence, R. I., Meteor oils, etc.
354 **National Pump Company,** Dayton, O., storage systems.
554 **New York & New Jersey Lubricant Company,** New York City, Non-Fluid oils and Motorol.
360A* **Nugget Polish Company of New York,** New York City, polish.
553* **Randall-Faichney Company,** 251 Causeway street, Boston, B-line grease guns.
534 **Wm. C. Robinson & Sons Company,** Baltimore, Md., special oils.
239* **Rome Soap Company,** Rome, N. Y., soaps and polishes.
225 **Howard B. Sawyer Oil Company,** 65 Long wharf, Boston, Sawyer oils.
412* **T. R. Shannon,** 19 Loraine street, Hartford, Conn., Rapid polishes.
321 **Standard Oil Company,** 50 Congress street, Boston, Polarine oils.
426A* **Texas Company,** New York City, Texaco oils.
363 **S. P. Townsend & Co.,** Orange, N. J., grease guns.
323 **Underhay Oil Company,** 74 Batterymarch street, Boston, Underhay oils.
556 **Vacuum Oil Company,** 49 Federal street, Boston, Vacuum Mobiloils.
301-302 **Valvoline Oil Company,** 27 State street, Boston, Valvoline oils.
353* **Wayne Oil Tank & Pump Company,** Fort Wayne, Ind., Wayne storage systems.
419* **White & Bagley Company,** Worcester, Mass., Oilzum, etc.
429B* **Wolverine Lubricants Company,** 80 Broad street, New York City, Wolf's head oils.

SELF-STARTING DEVICES.

514* **Apple Electric Company,** Dayton, O., Apico.
621-622 **Aristos Company,** 250 West 54th street, New York City, Disco.
600* **Boston Safety Crank Company,** 585 Boylston street, Boston, safety cranking device.
405-406* **Cox Brass Manufacturing Company,** Albany, N. Y., Cox.
525 **Dean Electric Company,** Elyria, O., Titanic.
415* **Detroit Electric Appliance Company,** Detroit, electric starter.
505 **Hartford Suspension Company,** Jersey City, N. J., electric starter.
337* **John W. Tudor,** 35 Congress street, Boston, Tudor.

SPEED INDICATORS.

522 **Hoffecker Company,** 222 Eliot street, Boston, Hoffecker.
555 **Jones Speedometer Company,** New York City, Jones.
453* **Reliance Speedometer Company,** 134 Eliot street, Boston, Reliance.
607* **Stewart & Clark Manufacturing Company,** 174 Columbus avenue, Boston, Stewart.
624* **Stover-Lang Company,** 219 Columbus avenue, Boston, Stover-Lang.
557-558 **Veeder Manufacturing Company,** Hartford, Conn., Veeder.
420* **Warner Instrument Company,** 925 Boylston street, Boston, Warner Auto-Meter.



LAMPS AND LIGHTING.

514* **Apple Electric Company,** Dayton, O., Apico dynamos.
621-622 **Aristos Company,** New York City, Fraty lighting system.
411* **Auto Parts Company,** 50 Exchange place, Providence, R. I., Ford attachments.
525 **Dean Electric Company,** Elyria, O., Dynalux dynamos.
415* **Detroit Electric Appliance Company,** Detroit, dynamos.
500* **Edison Storage Battery Company,** 895 Boylston street, Boston, batteries.
546-547 **Electric Storage Battery Company,** Philadelphia, batteries.
426B* **Enterline Company,** Lafayette, Ind., Matchless lighting system.
361 **G. C. A. Manufacturing Company,** Pittsfield, Mass., lighting equipment.
434 **Gray & Davis,** Amesbury, Mass., Gray & Davis dynamos.
604* **Motor Specialties Company,** Motor Mart, Boston, flash lighters.

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336* Narragansett Chemical Company, Providence, R. I., lamps and lighting systems.
543 Remy Electric Company, Anderson, Ind., Remy magneto lighting system.

SIGNALLING DEVICES.

405-406* Cox Brass Manufacturing Company, Albany, N. Y., horns.
619* Smalley Daniels, Motor Mart, Boston, Waymaker.
525 Dean Electric Company, Elyria, O., Tuto.
447-448* Gabriel Horn Manufacturing Company, Cleveland, O., Gabriel.
416* Lovell-McConnell Manufacturing Company, Newark, N. J., Klaxon.
428* G. Piel Company, Long Island City, N. Y., Long horn.
553* Randall-Faichney Company, 251 Causeway street, Boston, Jericho and Jubilee.

TOPS AND WINDSHIELDS.

325* Columbia Tire & Top Company, 1014 Commonwealth avenue, Boston, windshields.
405-406* Cox Brass Manufacturing Company, Albany, N. Y., windshields.
619* Smalley Daniels, Motor Mart, Boston, Boreas windshields.
447-448* Gabriel Horn Manufacturing Company, Cleveland, O., windshield cleaner.
550* Pantasote Company, 11 Broadway, New York City, top materials.

CARBURETORS, ETC.

432 S. F. Bowser Company, Inc., 141 Milk street, Boston, Bowser storage systems.
445 C. R. G. Manufacturing Company, Saugus, Mass., C. R. G. carburetors.
511* Dover Stamping & Manufacturing Company, Cambridge, Mass., cans, funnels, etc.
618 Holtzer-Cabot Electric Company, Brookline, Mass., Newcomb carburetors.
300 Ideal Oil Pump & Tank Company, 146 Summer street, Boston, Ideal storage systems.
354 National Pump Company, Dayton, O., storage systems.
422* Stromberg Motor Devices Company, Motor Mart, Boston, Stromberg carburetors.
353* Wayne Oil Tank & Pump Company, Fort Wayne, Ind., Wayne storage systems.

SHOCK ABSORBERS, ETC.

342* Acme Torsion Spring Company, 21 Cambridge street, Boston, Acme torsion springs.
444 Air Shock Absorber Company, 585 Boylston street, Boston, shock absorbers.
621-622 Aristos Company, New York City, Mondex shock absorber.
504* Connecticut Telephone & Electric Company, Meriden, Conn., Connecticut shock absorber.
608* Ernst Flentje, 1613 Cambridge street, Cambridge, Mass., Flentje shock absorber.
447-448* Gabriel Horn Manufacturing Company, Cleveland, O., Foster shock absorber and Gabriel rebound snubber.
506 Hartford Suspension Company, Jersey City, N. J., Truffault-Hartford shock absorber.
303* Modern Auto Appliance Company, Chatham, N. Y., Little Steersman spiral springs.

JACKS, WRENCHES, ETC.

359 Ames Auto Jack Truck Company, Franklin, Penn., jacks.
513* Auburn Auto Pump Company, 537 Tremont street, Boston, jacks.
411* Auto Parts Company, 50 Exchange place, Providence, R. I., special Ford tools.
243-244* Chandler-Farquhar Company, 34 Federal street, Boston, machine tools.
435 Coes Wrench Company, Worcester, Mass., Coes wrenches.
357* Detroit Tool Sales Company, 60 State street, Boston, 6-in-1 tool chests.
505 Hartford Suspension Company, Jersey City, N. J., Hartford auto-jacks.
416* Lovell-McConnell Manufacturing Company, Newark, N. J., Raiswell jacks.
348* Frank Mossberg Company, Attleboro, Mass., socket wrenches.
604* Motor Specialties Company, Motor Mart, Boston, jacks.
246* Standard Wrench & Tool Company, Providence, R. I., Fitzall wrenches.
304* William L. Tobey, 9 Lewis street, Boston, tire tools.

GENERAL ACCESSORIES.

616-617* Bi-Motor Equipment Company, 177 Portland street, Boston.
449 F. Shirley Boyd, 903 Boylston street, Boston.
615* Coward Auto Supply Company, Motor Mart, Boston.
619* Smalley Daniels, 23 Motor Mart, Boston.
612* C. J. Dowsing, 1777 Broadway, New York City.
620* Walter J. Forbes, 243 Columbus avenue, Boston.
349, 404* Hub Cycle Company, 40 Portland street, Boston.
315 Lunt, Moss Company, 43 Market street, Boston.
441-442* Chas. E. Miller, 202-204 Columbus avenue, Boston.
611* Motor Accessories, Inc., 749 A Boylston street, Boston.
425* Post & Lester Company, 223 Columbus avenue, Boston.
601* T. F. Russell & Co., 176 Federal street, Boston.
400-401 Standard Auto Supply Company, 104 Portland street, Boston.

MISCELLANEOUS.

... J. Q. Adams & Co., 120 Boylston street, Boston, dictionaries.
604AA* Aetna Life Insurance Company, 4 Liberty street, Boston.
364 American Brass Company, 99 John street, New York City.
356AA* American Technical Society, 144 High street, Boston.
440AA* Aluminum Solder Company, 199 Berkeley street, Boston, aluminum solder.
305-306* Autogenous Welding Company, 41 Bay street, Springfield, Mass., welding equipment.
518* Baldwin Chain & Manufacturing Company, Worcester, Mass., transmission chains, etc.
356* Boyd Motor Company, 27 Stanhope street, Boston.
508AA Walter S. Bucklin, 30 Kilby street, Boston.
341 Clark Foundry Company, Rumford Falls, Me., castings.
537 Wm. Cramp & Sons Ship Building & Engineering Works, Philadelphia, special metals.
351 Deane Steam Pump Company, Holyoke, Mass., power pumps.
239, 352 Duren & Kendall, 34 Summer street, Boston, vacuum cleaners.
339-340, 345-346* Fairbanks Company, 34 Pearl street, Boston, motors.
212* Frontier Iron Works, Buffalo, N. Y., Frontier aerial motors.
562AA* Hillman Auto Supply Company, 98 Massachusetts avenue, Boston, lacquer work.
319* George N. Holden, 141 Massachusetts avenue, Boston, Indian motorcycles.
...* International Automobile Association, Old South building, Boston, membership campaign.
...* Jackson & Co., 126 Tremont street, Boston, fur clothing.
300B* J. J. Kelleher, 610 Columbus avenue, Boston.
362* Margaret E. Knight, Charles and Hollis streets, South Framingham, Mass., new motor.
450AA Millbury Steel Foundry, Millbury, Mass., steel castings.
... Moore-Smith Company, 250 Devonshire street, Boston, clothing.
...* Morrison Ricker Manufacturing Company, Grinnell, Ia., Grinnell gloves.
528* National Tube Company, Pittsburg, Penn., tubing.
356BB* N. E. Casualty Company, 40 Kilby street, Boston, insurance.
235-236* Norton Company, Worcester, Mass., grinding wheels, etc.
328 P. G. H. Bennett & Co., 27 Lansdowne street, Boston, machinery.
307 Pyrene Company of New England, 176 Federal street, Boston, fire extinguishers.
344 Raymond Engineering Company, 53 State street, Boston.
338, 347 Milton E. Rogers, 420 Tremont building, Boston.
...* P. R. Rose, 62 St. Germain street, Boston.
605* John A. Salman, 17 Bromfield street, Boston, name plates and monograms.
338 Sheldon Axle Company, Wilkesbarre, Penn., axles and parts.
446-447* Sewell Cushion Wheel Company, Detroit, spring wheel.
213* S. K. F. Ball Bearing Company, 50 Church street, New York City, ball bearings.
530-531* Standard Roller Bearing Company, Philadelphia, Penn.
443 Steel Specialties Company,** 101 Tremont street, Boston.
559* Valentine & Co., 74 Pearl street, Boston, varnishes.
502 Walpole Rubber Company, 154 Summer street, Boston.
451* Waltham Watch Company, 200 Devonshire street, Boston.
516 Whitney Manufacturing Company,** Hartford, Conn., transmission chains, etc.
514 Willaker Chain Tread Company, 12 Pearl street, Boston
450* Edgar T. Ward & Sons, 25 Purchase street, Boston, tubing.

*Indicates exhibitor will show one week only.

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NEWS OF THE COMMERCIAL VEHICLE INDUSTRY.

Lanchester-Daimler Worm Drive to Be Produced in America---Pertinent Information Concerning Production and Selling---Truck Shows in Smaller Cities.

Coincident with the return of W. C. Baker, president and mechanical engineer of the American Ball Bearing Company, Cleveland, O., from an European trip comes the announcement that this concern has supplemented its present product by the addition of a complete line of worm driven axles, in which the imported type of Lanchester-Daimler worm and worm wheel will be utilized. In this connection, it is remembered that Mr. Baker designed and constructed the first bevel gear driven axle to be used in an automobile in this country. His adoption of the worm drive is expected to bring about as important consequences in the industry as his action with reference to the bevel gear at a time when its use was considered impossible.

Of course, the worm drive situation is by no means analogous to that of the bevel gear at the time mentioned. This system of final drive has been in successful use in America for more than a year, and the result of the recent shows indicates that it is to be employed even more generally in the future. Interest in worm construction is therefore decidedly keen just now.

The Lanchester type has been most thoroughly tried out under all sorts of conditions and is widely used by a number of prominent foreign truck manufacturers. It is the result of years of study and experimentation on the part of Mr. Lanchester of the Lanchester Motor Car Company, Coventry, England, and the Daimler and Lanchester companies, which have been using worm drive for the past 10 years, have adopted it exclusively on their entire output. It also has found recognition in such well known pleasure cars as the Minerva, Panhard and others.

The design is that commonly known as the enveloping or hour glass type. However, it is distinct from all others in use today, because of the fact that Mr. Lanchester has been able to perfect special machinery and cutters which are claimed to eliminate all hand finishing operations and to leave the worm and gear absolutely true as to tooth form.

"While abroad," says Mr. Baker, "I investigated the various other types of worms and gears in use, and was especially impressed with the Lanchester type. As the matter of properly mounting, so as to result in rigidly holding the worm and gear in the axle construction is of vital importance, this point received careful consideration. I was gratified to find that our own manufacturing practise would permit of the adaptation of the Lanchester worm in our axle construction without modification or changes. The two harmonize perfectly."

Mr. Baker was accompanied on his trip by Charles E. Davis, general manager of the Warner Gear Company, Muncie, Ind., and this concern has contracted with the Daimler company and Mr. Lanchester for the exclusive right to the Lanchester worm and worm wheel in the United States and Canada.

TO MAKE ELECTRIC DELIVERY WAGONS.

William E. Pratt of the Pratt Manufacturing Company, Joliet, Ill., has purchased the personal property of the Economy Motor Car Company of that city, and has submitted a bid for the real estate, which probably will be accepted. It is understood that Mr. Pratt will operate the plant for the production of electric vehicles of the light delivery and roadster types.

During the past year W. R. Everett, formerly president of the Economy company, has developed these electric vehicles, some of which have given excellent satisfaction in the hands of purchasers. Owing to unsettled matters regarding the plant, the new management has not made any definite statements, but it is known that the cars will be priced moderately.

DECATUR TRUCK GOING TO GRAND RAPIDS.

According to a dispatch from Decatur, Ind., a movement is on foot to remove the plant of the Decatur Motor Car Company, maker of Decatur "Hoosier Limited" trucks, from that city to Grand Rapids, Mich. This information indicates that Grand Rapids capitalists are prepared to invest $100,000 in the concern, providing this move is made.

PRODUCES ELECTRIC OMNIBUS.

The first vehicles produced by the Electric Omnibus Corporation of New York City, which was incorporated about six months ago, has been placed with Carson, Pirie, Scott & Co., Chicago. These vehicles are designed by C. J. Field, who has been identified prominently with electric railroad engineering for some years, and are equipped exclusively with the Edison battery. The plant is at Troy, N. Y.

The 'buses mentioned are four in number, each with seating capacity for 18 passengers and of the pay-as-you-enter type. The driver acts as conductor as well, and collects the fares. It follows that the entrance is at the front, and it may be added that the driver is completely enclosed.

Part of the batteries are placed under a small hood in front and the remainder are under the passengers' seats. The gearing provides a maximum speed of 12 miles an hour, and with short boosting charges at end of each day's run, a daily mileage of 80 is obtained. The motor is a General Electric 60-volt series wound, and drives direct through a cardan shaft to jackshaft, final drive being by chains.

The controller is operated by means of a lever on the steering column, and is thoroughly protected against short circuiting. Two independent braking systems are provided, service members acting on drums at the extremities of the jackshaft and emergency on the rear wheels. Tires are 34 by 3.5 inches, dual, in the rear, and 32 by 3.5, single, in front.

WORCESTER WANTS DART COMPANY.

The Board of Trade in Worcester, Mass., is taking active interest in an endeavor to secure the plant of the Dart Manufacturing Company, maker of Best commercial vehicles, now located at Waterloo, Ia. At a recent meeting, the directors definitely decided to invite the company to locate its Eastern factory in that city and to secure $100,000 of Worcester capital, which will be half of the $200,000 increase contemplated, making the total capitalization of the concern, $325,000.

It is understood that if the proposed factory is located in Worcester it will be considered the main plant and will offer employment to between 400 and 500 workmen at the outset. This is based upon the assertion that the company now has orders for 4000 cars to be delivered during 1912.

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FORD MOTOR COMPANY TAKES IMPORTANT STEP.

The important bearing which the opening of the Panama canal will have upon American export business is beginning to be realized by the motor car industry. As a result, California and other Pacific Coast states undoubtedly will be included among the automobile manufacturing centres in the very near future. One of the first concerns to take this step is the Ford Motor Company of Detroit, which is seeking a site for a branch factory either at Los Angeles or San Francisco.

James Couzens, secretary-treasurer of the Ford company, has been on the coast during the past month, making arrangements for the new plant. It is understood that it will cost approximately $300,000 and will give employment to at least 800 workmen at the start. The construction and equipment will be modern in every particular, and the capacity will be about 5000 cars a year. As the Ford company manufactures both pleasure and commercial vehicles, both types will be constructed in the California plant.

The main building will be 500 by 500 feet, and will be of reinforced concrete construction throughout. Electric power will be employed to operate the machinery. Motors will be shipped to California from the plant on Long Island, and it is anticipated that the Panama canal will aid materially in the shipment of these. In addition, it is expected that the opening of that canal will mean a largely increased merchant marine, plying between the United States and the Far East, and the plans of the Ford company include the shipping of large consignments to Hawaii, Japan and the Asiatic Continent.

CHANGES PLANNED BY SMITH COMPANY.

According to a dispatch from Milwaukee, Wis., all shares of the A. O. Smith Company of that city, not at present held by those members of the concern actively engaged in the manufacture of automobile parts and forgings, will be purchased by persons intimately connected with the corporation. The stock affected by the transfer is valued at about $500,000, while the total capitalization of the company is $1,000,000.

It is announced that the change in stockholders, which has been contemplated for some time according to the dispatch, will be made in order to effect a more compact organization. No immediate changes in the extent or control of the corporation are in view, it is said, and the policy of the management will remain the same. The information is of interest in view of the recent announcement of a five-ton truck bearing the Smith name.

CANADA'S MILLION DOLLAR CONCERN.

The Gaselectric Motors, Ltd., St. Thomas, Ont., has been incorporated at Toronto with capital of $1,000,000. While the plans of the concern are still unannounced, it is understood that motor cars will be produced in which electricity will be generated by a gasoline engine on the car itself, the power being applied to the road wheels by separate motors located in the hubs.

NEW TAXIMETER PRESENTS RECEIPT.

Walter Lewin of San Francisco, Cal., has perfected the Lewin taximeter, which is to be placed in the market by the Pacific Taximeter Company, recently organized in that city. In addition to the usual functions of a device of this nature, the new product will present the customer with a receipt for the fare paid. In effect, it will keep its own books and eliminate the necessity for frequent inspection by the operating company.

The meter is built in two units, called the registering and duplicate ticket device, respectively. The registering portion is operated by a series of gears thrown into and out of mesh by the tariff lever, which is in turn coupled up and directly connected to the registering wheels. The duplicate ticket device is that portion of the meter which is mounted in the cover and can be removed from the instrument by unlocking a Yale lock.

There are two reels for the duplicate and original ticket, which roll over guide rollers parallel with the face of the registering wheels when in position, the duplicate ticket being rolled again on a drum and the original being discharged through a chute in the side of the meter. On the same cover the whole of the stamping device is mounted somewhat on the principle of a typewriter hammer, each character on the registering wheels having a separate hammer that imprints on the ticket.

SWETLAND HEADS COMMER DIRECTORATE.

H. M. Swetland, who is well known in the industry because of his connection with its publications, has resigned as president of the Class Journal Publishing Company, New York City, to become chairman of the board of directors of the Wyckoff, Church & Partridge, Inc., maker of Commer trucks in America, under license from Commercial Cars, Ltd., of England.

ADOPTS INTERNAL GEAR DRIVE.

Incorporated recently to manufacture a light delivery car to sell at a popular price, the General Industrial & Manufacturing Company, Indianapolis, Ind., announces the adoption of the internal gear drive. The model in which this will be employed is a 1500-pound wagon, designed for general use, which is expected to appeal to a large class of purchasers.

Among the advantages claimed for this type of drive are the complete enclosure of all working parts, carrying the load on a solid axle, and transmitting the power by an independent live axle. One of the most interesting examples of this type of car, is cited in the vehicles used on the Fifth avenue omnibus line in New York City, which have been in use for a long period. Others of a similar design have been in successful service in England and Germany. The German army has favored this type, and has many such vehicles in operation.

ANOTHER TRUCK CONCERN IN WISCONSIN.

Announcement is made of the incorporation of the Piggins Motor Truck Company, Racine, Wis., with capital of $125,000. This is not a new concern, in the strict sense of the word, and the product will not be entirely new, inasmuch as those who comprise the company have been engaged in the production of commercial cars in a small way for some time.

Early in the history of the industry, C. B. and F. H. Piggins of Racine started the manufacture of gasoline engines and specialties. Three years ago they became makers of trucks and pleasure cars, and several of these have been giving splendid satisfaction in service. The new plans call for enlarged factory and machine shops, so that the entire attention may be devoted to the production of commercial vehicles on a larger scale.

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GENERAL MOTORS BEGINS EDUCATIONAL CAMPAIGN.

Gleeson Murphy, who is recognized as one of the most expert commercial vehicle salesmen in the country, has become vice president of the General Motors Truck Company, Detroit, and assistant to President Neal of the General Motors Company, which is the parent organization of the truck concern. Mr. Murphy has spent much time in investigating industrial transports in service and has a thorough knowledge of what should be expected from a vehicle of this type. Under his management the company will undertake a nation-wide educational campaign, in which the results of his investigations will be instilled into the minds of hundreds of business men throughout the country.

Briefly outlined, the particular reasons why business men should use motor trucks are set forth by Mr. Murphy as follows: Because they will increase the efficiency of the delivery system, give prestige, help increase business, enable a large territory to be covered in a given time, work every day in the year, and will not be affected by the elements, heat or cold. In addition, he contends that the efficiency of the entire organization is judged by the manner in which the business man is able to deliver goods.

Based upon the fact that previous to Jan. 1, 1912, $60,000,000 worth of trucks had been sold since the inception of the industry, Mr. Murphy suggests that business men should study the new method of transportation because they are able to get unbiased opinions from the manufacturers, and to make a thorough investigation of the relative merits of the gasoline and electric systems. He holds that the market affords a wide range of capacities and bodies both in the electric and gasoline types.



Gleeson Murphy, Vice President, General Motors Truck Company.

That the motor truck is a certainty, having reached a standardization that insures its every-day use, is another argument. It is applicable to nearly all lines of business. owing to the wide choice offered in the matter of body designs and mechanical equipment. Economy is taken care of in the suggestion that the motor truck takes the place of two or three teams, depending largely upon the routing and extent of the delivery system in question. As a final feature, it is noted that the mechanical conveyance will carry loads and negotiate hills impossible for horses to undertake.

NEW TRUCK FROM NORTH CAROLINA.

Another instance in which a well known manufacturer of wagons has been replaced by a new concern which will devote its attention to the production of motor trucks, comes from Charlotte, N. C. A few years ago the Wadsworth Wagon Works of that city, which had been engaged in the construction of wagons for many years, was succeeded by J. L. Owens & Son, which became interested in the automobile industry, through the manufacture of tops and upholstery, in addition to its large business of painting bodies, etc.

This latter concern now has been reorganized as the Owens Wagon & Automobile Works with capital of $50,000. It appears that its predecessor had been experimenting with the construction of commercial vehicles during the past year, and is ready to place in the market at least one model. The officers of the new concern are: President, J. L. Owens; vice president, Frank O. Owens; secretary and treasurer, Skinner S. Alston.

HEWITT WITH MACK AND SAURER.

The Hewitt Motor Truck Company, which was organized shortly before the New York show season began, has become amalgamated with the International Motor Company of New York City, which already was in control of the Mack Bros. Motor Car Company of Allentown, Penn., and the Saurer Motor Truck Company of Plainfield, N. J. Negotiations are said to be under way looking toward the purchase of at least one other concern, a prominent maker of electric vehicles, but no definite information has been vouchsafed by those interested.

It will be remembered that the Hewitt line is one of the oldest in the industry. Something over a year ago the Metzger Motor Car Company of Detroit purchased the original company, principally for the purpose of acquiring a Selden patent license. Hewitt trucks, ranging in capacity from 1500 pounds to 10 tons, have given excellent satisfaction in the hands of users since the first vehicles were placed in the market, and it caused little surprise when it was announced in December that the original people had formed a company under the old name to take charge of their production again.

It has been known for some time in the industry that the International Motor Company was anxious to increase its holdings, particularly in the matter of offering a wide variety of truck sizes. The rumored purchase of the Hewitt concern early in the month proved to be premature, but the official announcement was made Feb. 28. The new arrangement goes into effect March 1.

WAGON MAKER TO PRODUCE TRUCKS.

Although engaged in the production of wagons for a number of years, C. T. Woolson of Riverton, N. J., has been interested in the sale of automobiles for the past five years. Recently he was instrumental in the organization of the Woolson Auto Truck Company, which will produce a two-ton vehicle to sell at a moderate price. Announcement is made that the first truck of the Woolson design will be completed and on the road within 30 days.

WILL EXPLOIT ELASTIC WHEEL.

The American Elastic Wheel Company of 11 Broadway, New York City, has been organized for the purpose of exploiting the Feroci wheel, of Italian origin, although protected by American patents. It is claimed that a number of these wheels have been utilized on army trucks by the Italian government and that these have given excellent satisfaction. The device employs a series of rubber buffers and spiral steel springs. The officers of the concern are: President, Walter D. Ward; vice-president, Caesar Feroci, the inventor, and treasurer, Frank Ward.

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SPLENDID INTEREST IN BALTIMORE'S TRUCK DISPLAY.

As an indication of the increasing interest being displayed in the use of commercial vehicles in Baltimore, it is remembered that but four makes of trucks were shown last year in connection with the local automobile show. This year the dealers of that city held a separate exhibition of industrial transports under the auspices of the Automobile Club of Maryland, Feb. 26-28, in which more than 70 models were displayed by 22 agencies.

The Fifth Regiment Armory was beautifully decorated for the pleasure car show, which immediately preceded this event. In addition to the vehicles on display within the hall, most of the dealers had demonstrators outside, and full opportunity was afforded for complete investigation of the problem of mechanical haulage. The exhibits may be described briefly as follows:

Atterbury Motor Car Company of Maryland, three and five-ton Atterbury; Callahan Bros. Company, Morgan, two-ton delivery, five-ton truck and three-ton chassis; Chase Motor Truck Company, one Chase truck; Consolidated Gas Electric Light & Power Company, two and three-ton vehicles of company's own make; Enterprise Fuel Company, three two-ton Gramm trucks and three-ton Gramm coal dumper; Everitt Auto Company, one and three-ton trucks on Everitt chassis; Ford Auto Company, Ford delivery wagon; Foss-Hughes Company, five-ton Pierce-Arrow truck and stripped chassis showing worm drive; International Harvester Company, three 1000-pound International delivery wagons; International Motor Company, 4.5-ton Saurer, one and two-ton Mack trucks, three-ton Mack brewery truck, four-ton Mack hose wagon, and five-ton Mack self-dumper; Kelly Motor Truck Company, one and three-ton Kelly; Lozier Sales Company, five-ton stripped Lozier chassis; Mar-Del Mobile Company, two-ton Packard stake wagon and three-ton chassis; Mount Vernon Motor Company, 1.5-ton Autocar and stripped chassis; Neely & Ensor, four Alco trucks ranging from two to five tons, and two Lippard-Stewart vehicles; Norwood Bros., Inc., three-ton Seitz stake truck, one-ton Seitz chassis, and 1000-pound Lincoln wagon; Oakland Motor Company, three 1.5-ton Federal trucks; George R. Snodeal, 6.5-ton imported Commer chassis; Standard Motor Car Company, 1000-pound Cadillac chassis; Stoddard-Dayton Auto Company of Baltimore, three-ton Sampson chassis and 1000-pound delivery wagon of same make; White Automobile Company, 1500-pound wagon, three and five-ton trucks and three-ton chassis, all of White make; Zell Motorcar Company, five-ton Peerless chassis and 1500-pound Chalmers delivery wagon.

CINCINNATI'S COMMERCIAL CAR SHOW.

For the second time in the history of the Cincinnati Automobile Dealers' Association a special motor truck display was held in Music Hall, Cincinnati, O., during the week of Feb. 26-March 2. The event followed the pleasure car show of the previous week, and the same decorations were maintained for both exhibitions. The attendance was even larger than last year, and it is understood that much business was transacted.

Among those who made display were the following: Leyman-Buick Company, Mack, Saurer; Citizens Motor Car Company, Packard; R. C. Crowthers, Alco, Veerac; U. S. Motor Truck Company, United States; Hanauer Automobile Company, Pierce-Arrow; Psthelhoff & Braukmann, Hatfield; Dr. H. C. Wendel, Dorris; Haberer & Co., Cino; Cincinnati Automobile Company, Peerless, Pope-Hartford; International Harvester Company of America, International; Schacht Motor Car Company, Schacht; Chicago Pneumatic Tool Company, Little Giant; Fischer Auto & Service Company, Speedwell; Herold Motor Company, Reo; Miller, DuBrel & Peters, Avery, Ideal; Otto Armleder Company, Armleder; Cincinnati Motor Truck Company, Federal; Glow Electric Company, Glowicke; Wilberding & Brandewedie, Modern; F. B. Williams Company, Sandusky.

MORELAND TRUCK FROM CALIFORNIA.

Claiming to be the third city in the country, with reference to number of commercial cars in active use, and realizing that California business men are alive to the possibilities of increasing the scope of their business by a really effective delivery system, Los Angeles, Cal., is taking active interest in an effort to become a large automobile manufacturing centre. Among the recent announcements is that of a new truck concern, the Moreland Motor Truck Company of that city.

Walter L. Moreland, manager of the company which bears his name, is a pioneer in the California automobile industry, having been connected with the first concern to manufacture pleasure cars in that commonwealth. The Moreland company will build trucks exclusively, the models ranging from 1.5 to 10 tons capacity. Several already have been constructed and have given good service in the hands of their owners. Continental motors and Timken axles are utilized, but all other parts are manufactured in the factory of the company at Wilhart and North Main streets.

PRODUCING GASOLINE RAILROAD CARS.

The Marion Motor Section Car Company, Marion, Ind., has been incorporated with capital of $300,000, for the production of a gasoline railroad inspection car, invented by W. O. and J. D. Worth of Chicago. The Worth brothers have been making this vehicle in small quantities for some time, but it became evident recently that additional capital would be necessary in order to keep abreast of the orders. Stockholders in the Indiana Auto Parts Company of Marion became interested in the proposition and the organization of the new concern resulted.

The car is equipped with a 20 horsepower gasoline engine, and has capacity for carrying 16 persons and hauling three trailers, making a total weight of not less than 50,000 pounds, at the rate of 25 miles an hour. It is claimed to have all the speed and ability of a steam locomotive, either forward or backward, up to 40 miles an hour, and without the use of a gear in its construction. The weight is light, and nickel and other special steels are used throughout.

The factory will be located in Marion. The work of drawing plans and specifications has been going on for some time, and the company is ready to produce from 12 to 15 cars daily. It is understood that railroad companies are anxious to take all that can be manufactured.

MARYLAND FIRM ENTERS TRUCK FIELD.

Believing there is a decided market for a light delivery wagon of the proper construction, the Kuhner Engineering Company, Oxford, Md., has turned its attention to the production of trucks of this character. The concern has been producing automobile motors for some time past, and will utilize this product in the new undertaking. The factory has a tidewater frontage, and is 50 by 160 feet. The officers of the company are: President, H. E. Kuhner; vice president, Alexis G. Pascault; secretary, George M. Wingard; treasurer, William B. Shannahan.

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THE A B C OF MOTOR TRUCK OPERATION.

A Simple Exposition of the Principles Underlying Operation, Maintenance and Repair of All Motor Driven Commercial Cars, Describing Details of Components. Part XVI—Outlining Principles of Selective Type Transmission.

By C. P. Shattuck.

REFERENCE has been made to the planetary form of transmission which has many advantages, inasmuch as it is a device especially adapted to being handled by the most inexperienced without liability of damage. It possesses a feature also shared by the sliding gear system, that of furnishing a direct drive on the high speed, this being brought about by locking the high speed clutch disc and by the transmission revolving as a unit as previously explained. Its greatest drawback lies in the production of but two forward speeds and a reverse. Although providing a quiet and efficient means of transmitting energy to the traction wheels when the high speed is utilized, there is more or less noise attendant upon the use of the other gears after a time. It is very compact, occupies but little room, and when the gears are enclosed in oil tight casings, and these packed with suitable lubricant, both wear and noise are eliminated to a large extent.

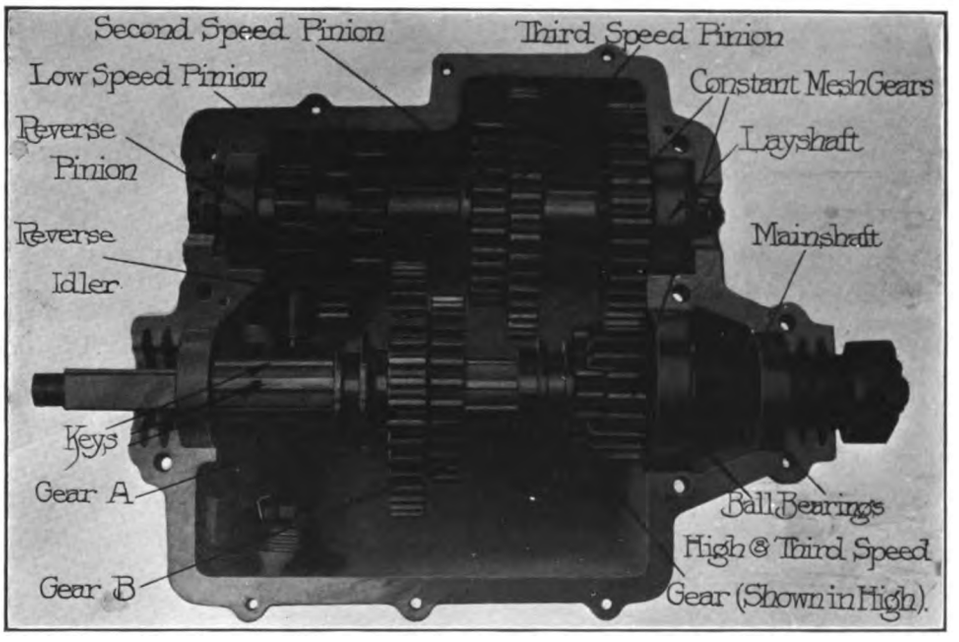


Fig. 65—Depicting the Components of a Four-Speed Gearbox of the Selective Form—The Third or Direct Drive Member Is Shown in Engagement.

At Fig. 68 is depicted a conventional form of planetary transmission utilized on mechanical transports with part of the casings removed to show the gears and the arrangement and location of the brake drum. These drum members revolve and stopping the motion of one by means of a suitable brake band will give a slow speed forward, while clutching the other drum will bring about a reverse movement. As the gears are continually in mesh the speed changes may be made easily and all danger of stripping the gears is eliminated. Owing to the utilization of brake bands, the low and reverse ratios are obtained in a gradual manner even if they be operated by an inexperienced driver.

To obtain the high or direct drive the high speed clutch disc is forced against the drum casings by small fingers or bell cranks, being expanded by a cone member. When the cone is in place, the pressure between the fingers and the clutch disc locks the gear drum to the shaft and causes the whole to revolve as a unit.

The high speed may consist of a cone, or a number of discs faced with fibre, or asbestos and wire cloth as friction facing, and provision is made for adjustment by screwing the spider carrying the bell cranks so that they will be brought closer to the disc or cone. The braking bands are lined with various materials and to derive efficiency these members must be so adjusted as to grip firmly when in service, but not bind when the high speed is employed and the transmission revolving as a unit. Should undue friction be set up it will act as a brake when the vehicle is being operated on the direct drive.

The planetary transmission is made in several forms but the basic principles upon which it operates are similar. Control of the three speeds may be by pedal or lever. For example, the low speed and the reverse clutching members may be actuated by a separate pedal and a hand lever be utilized to operate the high. Some forms may provide for operation by pedals alone. It is obvious that this type of transmission has its advantages, among which may be mentioned that the reverse may be employed as a brake in the event of the usual members failing to operate. A four-speed planetary transmission would be complicated, difficult to construct as well as apply, and to provide for more than two forward speeds the sliding gear is employed. This permits of three or four forward speeds and a reverse, according to the design, thereby giving a wider range of speed gears, and permitting the operator, no matter what road conditions he may encounter, to secure from the motor a very economical expenditure of power.

Sliding gear arrangements may be divided into two classes; namely, progressive and selective. The selective type differs from the non-selective inasmuch as it permits the choice and use of any set of speed gears instantly, without passing through intermediate gears. In the use of the non-selective type, should the car be running on the third or direct speed, and the operator desires to change to the first, he is compelled to disengage the third speed, and to engage and disengage the second before the desired low may be reached. This is overcome in the selective type, where the operator merely disengages the speed gears in use and engages the gears desired without being required to consider intermediate members.

The components of a sliding gear are outlined at Fig. 65, which depicts a conventional type of selective transmis-

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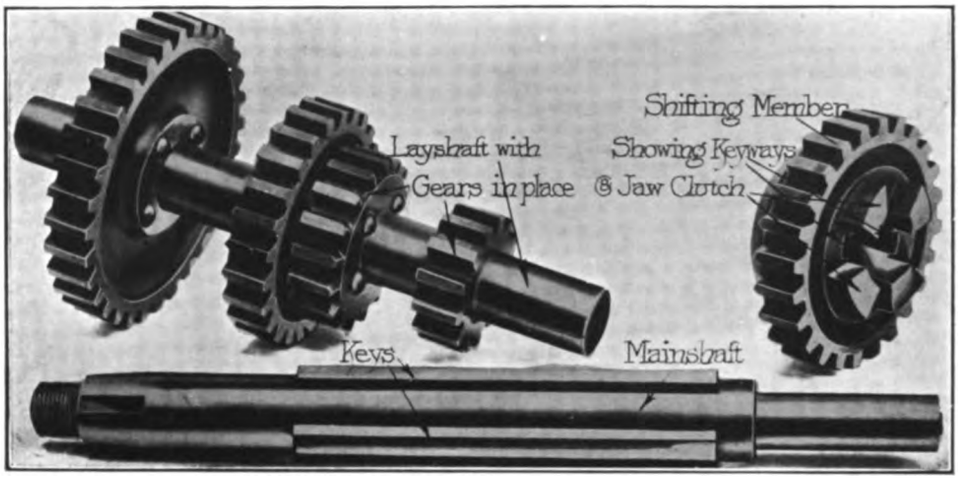


Fig. 66—Showing Layshaft of Sliding Gear Transmission, Shifting Member and Jaw Clutch, Which Is Fitted with Keyways to Slide on Mainshaft.

sion having four speeds forward and reverse. The engine and clutch have been previously described and their method of operation made clear. Upon the mainshaft of the gearbox, which really is a continuation or extension of the engine shaft, are carried a number of gears, these corresponding to similar members mounted upon another shaft parallel to the main member and in proximity to it. The second is termed the layshaft and it will be noted that it is fitted with a gear which is in constant mesh with another and smaller gear fixed to the main shaft. Upon the latter, which is round, although it may be of square design, are located movable gears, this action being secured by providing four milled keys which fit into four slots cut through the centre of each gear. This arrangement may be considered as solid on the shaft, inasmuch as the keys and shaft are one piece.

By reason of the keys on the shaft and the corresponding slots in the gears, the sliding gear is one that may move longitudinally on the shaft, and at the same time be so held by the keys that it must revolve uniformly and constantly with the shaft. At Fig. 66 is depicted the main shaft with keys, also a jaw clutch or shifting member with keyways outlined, and it is obvious that when this is fitted to the shaft it practically forms a solid, although slideable member. In other words, it has a free movement along the shaft when moved by means of a collar and yoke, but is no more independent of the shaft in the matter of revolution, than if the shaft and gear were one piece.

The gears upon the layshaft are fixed, as will be noted in the illustration, and these members are revolved by means of a gear in mesh with another on the main shaft and these are termed the constant mesh gears. Furthermore the gears on the lay and main shafts are so spaced that but one pair may be in mesh at a time; that is, care is taken in spacing the different members so that there will be no interference or striking between gears which do not form pairs and are not intended to mesh.

The number of gears fitted depends upon the speed employed and when four forward are utilized as in the gearbox at Fig. 65, the main shaft is equipped with three shifting members which gives the reverse, lowest and intermediate speeds. The other shifting member shown in the direct drive position, which is the third forward ratio, also serves for the fourth speed, which is higher than the direct drive. The constant mesh gear driven by the engine drives the constant mesh gear on the layshaft and the former causes the latter to revolve. When the shifting member is moved from the direct drive position so that it meshes with the largest layshaft gear, the main shaft rotates at a higher speed than the constant mesh gear driven by the motor which drives the layshaft.

If the operator desire to change from the direct to the second or intermediate speed, the clutch is disengaged and by means of a shifting collar which is actuated by the gear shifting lever, the shifting member fitted with the jaw clutch is moved out of engagement and another movement of the lever moves the gear B into engagement with the second speed pinion on the layshaft. If the low be desired the gear A is moved backward into mesh with the low speed pinion. As previously explained, with the selective type of transmission a direct change may be made from one speed to another at the will of the operator.

Assume that the driver desires to move the vehicle backward, an operation involving the use of the reverse mechanism. This is operated by the same lever that actuates all forward speeds, the only difference being that the gear on the layshaft does not mesh directly with the shifting member on the rear part of the main shaft, but instead these two gears engage an intermediate member, known as the reverse idler.

To explain best the operation of this member it must be understood that when the drive is transferred from the forward

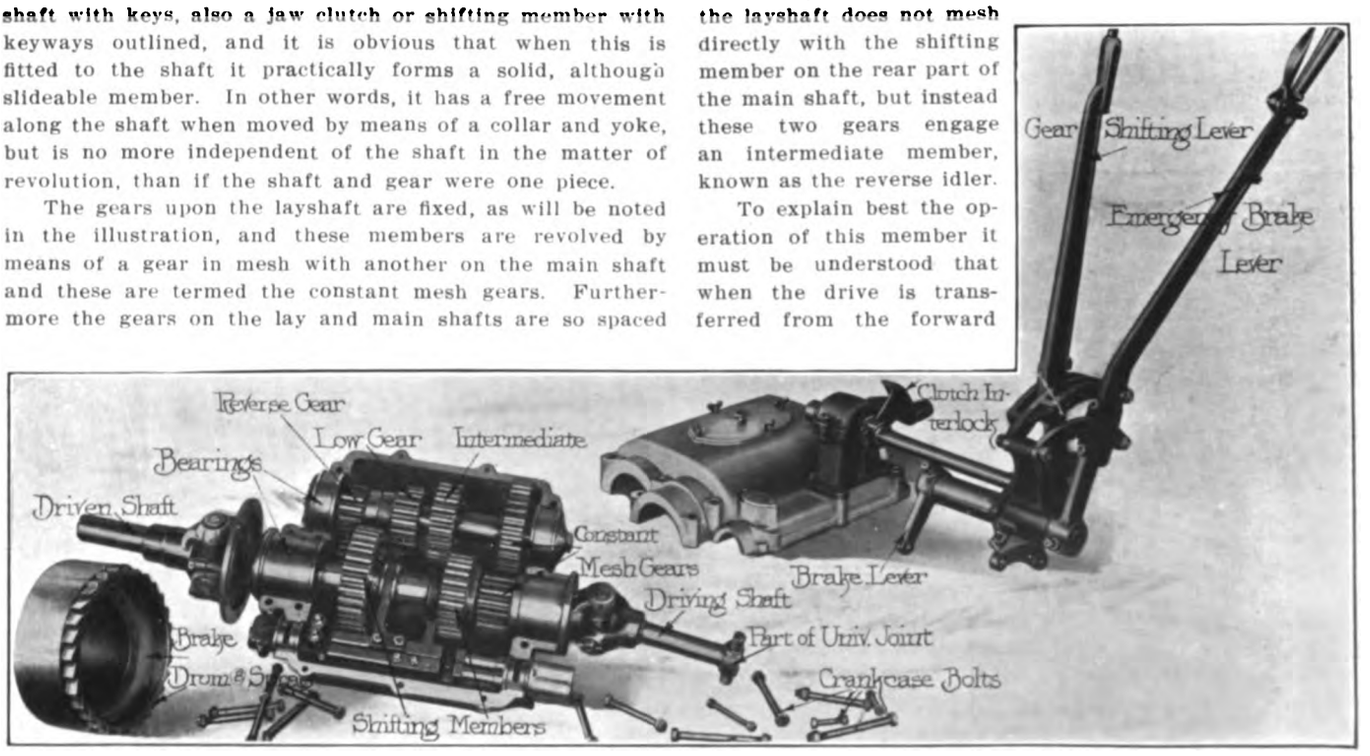


Fig. 67—Gearbox of Three-Speed Selective Type, Depicting the Gear Shifting Mechanism, Operated by Hand Lever, Attached to Upper Half of Transmission Case.

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part of the main shaft to the layshaft, the latter revolves in an opposite direction. When this motion is transmitted from the layshaft back to the rear part of the main shaft, the direction of rotation is again reversed, so that the rear part of the main shaft revolves in the same direction as does the forward section. If, between the gear on the layshaft and main shaft, an intermediate pinion be interposed, the latter will revolve in exactly the same direction as does the forward end of the main shaft, and if the intermediate pinion be meshed with another on the rear part of the main shaft, the motion of the latter will be similar to that of the layshaft, and directly opposite to the direction of the forward part of the main shaft. Thus, by the intervention of a reverse idler, a backward movement of the vehicle is obtainable.

Regarding the ratios or different speeds brought about by the use of the pinions: Assume that the gear A is moved into engagement with the low speed pinion. The latter will impart motion to the movable gear and as the latter is larger, the low speed pinion must make a certain proportionate number of revolutions to rotate the main shaft pinion. With the second speed pinion in mesh it is obvious that the speed of the main shaft is accelerated, and so on up to the direct drive.

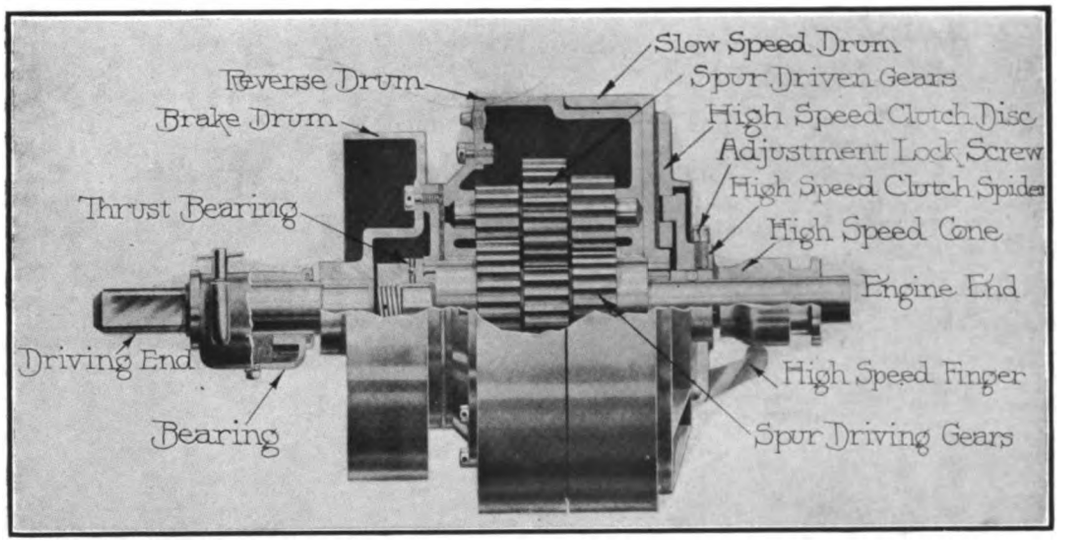


Fig. 68—Outlining Conventional Type of Planetary Transmission Affording Two Speeds Forward and Reverse.

The neutral effect is brought about when none of the speed pinions is in engagement with the shifting gear members. Under these conditions the clutch may be in and the layshaft will be revolving because of the motion imparted by the constant mesh gear.

Changes of speed are secured through the means of a lever, this being depicted at Fig. 67. The member in this instance is at the right of the operator although its location may be at the centre or left, depending upon the design of the car. The gear shifting lever has its movement restricted by what is known as a selective quadrant; that is, a metal frame so slotted that the lever may be pushed forward or backward in either of the two parallel channels. If the lever be moved forward in one of the channels, it brings one set of gears into mesh. If operated in the opposite direction in the same channel, it releases those gears already in mesh and slides a different set into engagement. In like manner all the various combinations are secured.

The mechanism controlling the changing or shifting of the gears, is by two rods parallel with the gearshaft, each of these having a shifting yoke attached thereto engaging in a groove on the shifting member hub. Each rod is equipped with a U shaped member in which a lever operates, these being actuated by the forks on either side of the inside segment member. The gear shifting lever is hinged at the bottom so that it may be oscillated from side to side, first engaging the inside fork, which has two positions, then being shifted through a slot and engaging the outside forked member. The inside fork operates the reverse and low speed, the outside the intermediate and high. The shaft which operates the high and intermediate members telescopes in the hollow shaft to which the low and reverse operating finger is attached. The forked member engaging the side of the control member nearer the operator is attached to the hollow controlling shaft.

An interlocking mechanism, the function of which is to prevent throwing into engagement two different combinations at the same time, is depicted at Fig. 67. The device also holds disengaged gears in such a position that they cannot be shaken into engagement and prevents the meshing of gears when the clutch is engaged. In other words, the interlocking device requires that the energy of the motor be interrupted by means of the clutch before it is possible to bring gear teeth into mesh.

Referring again to Fig. 67, it will be noted that the brake drum is equipped with a ratchet and pawl arrangement. This is located just back of the transmission case and is utilized when the vehicle is stopped on an upgrade. This service brake drum rotates at propeller shaft speed, or about eight times that of the rear wheels. The device is fitted with a positive interlocking mechanism which prevents the pawl from being thrown into engagement with the ratchet when the reverse gear is in mesh, or the use of the reverse member when the pawl is thrown into contact with the ratchet. By the use of the device it is claimed that a loaded vehicle may be held on any grade without the application of brakes, and that the machine may be restarted without the simultaneous releasing of the brakes and letting in of the clutch.

(To Be Continued.)

Ed. Note—The next installment will consider the progressive type of transmission and other forms, including those in which the gears are in constant mesh.

DEMAGNETIZATION OF MAGNETS.

The demagnetization of the magnets of a magneto is not generally understood. Although this seldom occurs the members may become demagnetized and when such is the case it usually is due to improper wiring. It is caused by passing the current of a battery through the magneto windings. Some makers of magnetos utilize the colored wire cable scheme to facilitate the installation of the wiring and to prevent mistakes, it being only necessary to connect each colored wire to a terminal of corresponding color. This plan is adopted by the Remy Electric Company, Anderson, Ind.

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SPECIAL BODY FOR ICE CREAM DELIVERY.

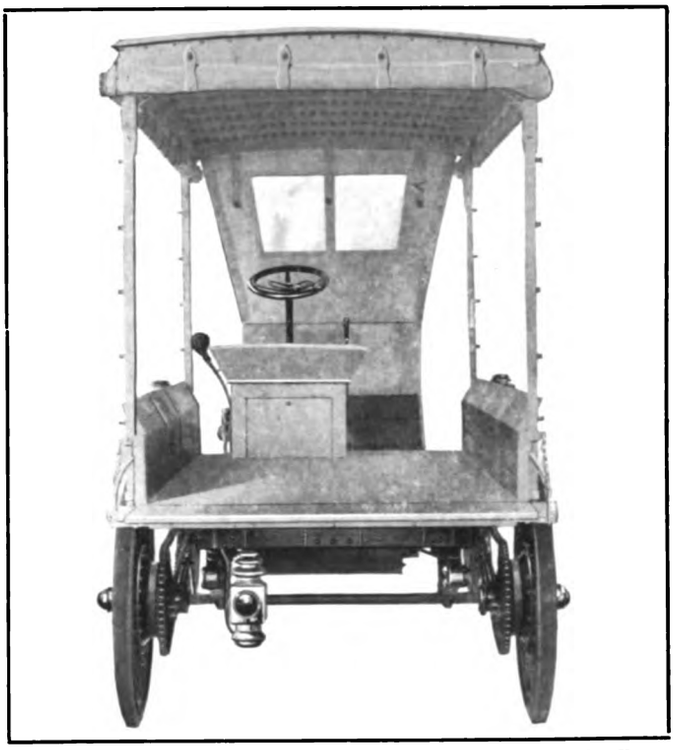
BECAUSE of the perishable nature of the product, the motor truck makes a particular appeal to those engaged in the delivery of ice cream. The possibilities for increased speed are such that the packages may be delivered with much less danger of loss, effecting an economy in addition to the ability to carry larger loads and make a greater number of trips in a given time than with horse drawn equipment. However, as with many other lines of business, it is desirable to consider the body problem with special reference to the work the vehicle will be called upon to do.

It is obvious that if one of the elements of economy in this utilization of the mechanical transport is its ability to carry a larger load, some provision must be made for securing the most advantageous use of the space available. As is well known, ice cream is packed for shipment in tubs and pails and it is somewhat impossible for these to be carried on top of each other. It follows that the floor of the truck must be utilized to its fullest extent, if the maximum carrying ability of the vehicle is to be realized.

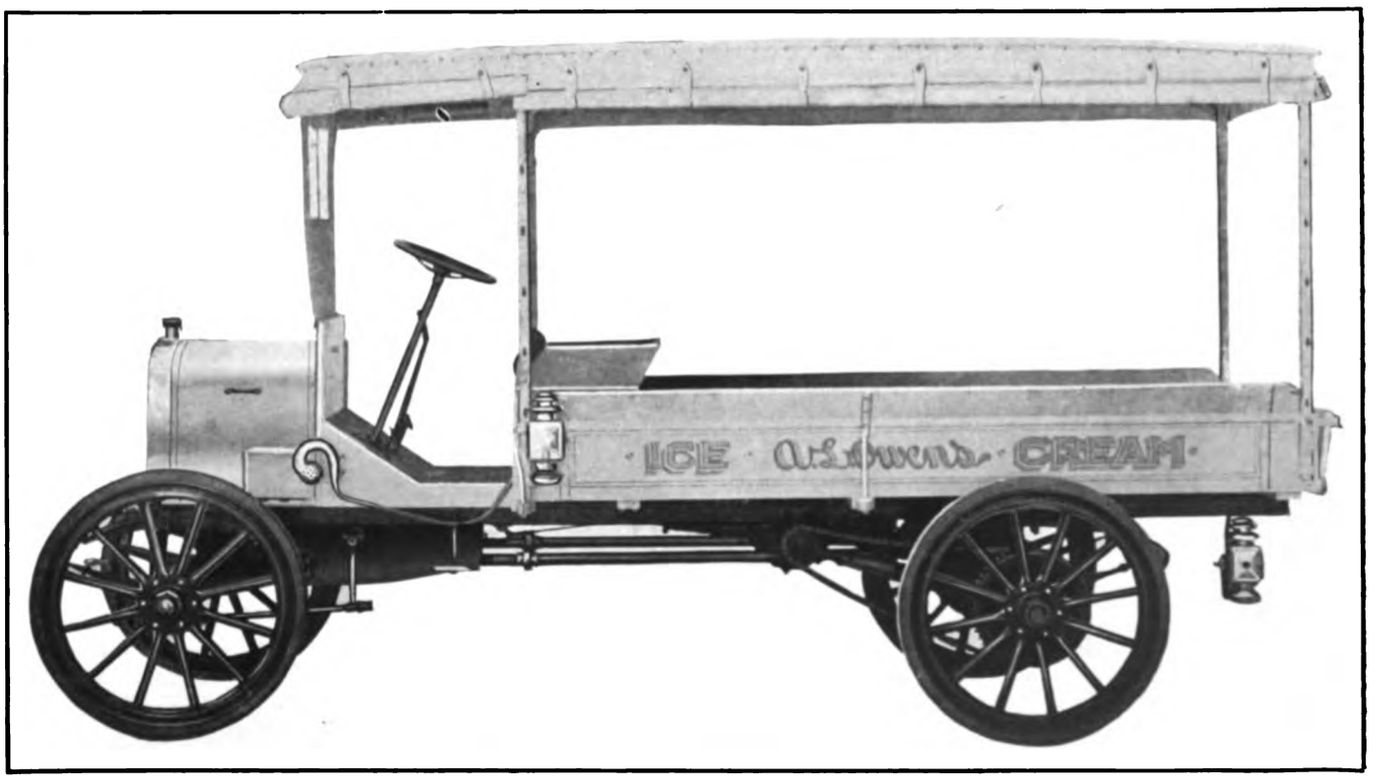
Accompanying illustrations present the solution offered by the Sullivan Motor Car Company, Rochester, N. Y., maker of Sullivan trucks. This machine was constructed for a Rochester ice cream dealer and was displayed during the recent automobile show in that city. The body was finished in white, lettered and striped in gold, and the running gear was red. Its attractive appearance was a matter of much comment during the exhibition, and a number of orders for duplicates of the construction were secured.

The smaller view gives a splendid idea of the interior as seen from the rear. This indicates particularly the method of providing for the utmost practical use of the floor space. It will be noted that the driver's seat is designed to occupy but half of the space in the front of the vehicle, and the openings on either side are available for storing packages of varying size.

This body has a width of 46 inches, inside, and that portion back of the seat is seven feet six inches in length. One-half of the body has a carrying space of nine feet nine inches, and this additional two feet and three inches is of decided value in the ice cream business. It may be added that the top is supplied with hinges so that it may be entirely removed, the stakes being designed to fold up with the top. While constructed specially for the ice cream dealer mentioned, among the orders taken at the show three were for plumbers and another for a rug and carpet concern.



Interior of Sullivan Ice Cream Wagon as Viewed from the Rear.



Special Body Design for Ice Cream Delivery Constructed by Sullivan Motor Car Company, Rochester, N. Y., Mounted on Regular Sullivan Truck Chassis.

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SOLVING THE PROBLEM OF THE GAS TURBINE.

What Is Expected of the New Internal Combustion Engine—Some of the Difficulties Which Must Be Overcome—Progress Made and Suggestions as to the Possibilities.

MORE power, less weight, elimination of noise and reduction in complications are among the objects sought in the development of gasoline engines for the propulsion of automobiles and aerial craft. With some engineers there is the suggestion that the present types in service have reached the limits of their possibilities in these respects. Leaving aside the merits of that position, it will prove of interest to consider some of the methods advanced for the solution of the problem in another manner.

For many years the gas turbine has presented a fascinating study in this connection, and while the progress has been rather less noticeable in America than abroad, it is worthy of mention that some degree of success has been attained. And it is especially in the features above enumerated in which the inventors expect superiority from the gas turbine. The difficulties to be overcome do not appear to be insurmountable; in fact, there already are constructors who claim to have solved the problem.

Principles of Construction.

In order to appreciate the progress in the development of the gas turbine, it is necessary to understand at least in a general way, the principles underlying its construction and operation, as well as some of the difficulties confronting the engineers now engaged in working out the proposition. The chief distinction between the gas and steam turbine lies in the fact that the first generates its own power within itself, while the latter is dependent upon a steam boiler for the power which it uses. For this reason, the gas turbine sometimes is termed a power generator.

The experiments made thus far may generally be classed under two somewhat distinct branches of design. One of these types represents the principle of a continuous burning of the gas and air mixture within a closed chamber, by means of which the gases are expanded and forced to and through the turbine wheel. This mixture is introduced to the chamber by means of a pump driven by the shaft of the turbine wheel.

Simplest Form of Gas Turbine.

A theoretical illustration of this type is shown in Fig. 1 A. In this, the chamber a, in which the mixture is burned by means of a continuous series of electric sparks, is protected from heat losses by a heavy asbestos covering. The fuel is pumped into this chamber through conduits b and c by means of a pump d, which is driven by the shaft of the turbine wheel e.

This is the simplest form of gas turbine, and the principles described have been the subject of much experimentation. However, it is considered improbable that success will be achieved along these lines. In the first place, it will be found difficult, if not impossible, to construct a pumping system qualified to act against such pressure and heat. In addition the mixture of partly burned and fresh gasoline and air hardly will be expected to burn properly. Then again, there is an ever increasing heat, which by continued use will result in spreading or warping surfaces which must be kept smooth and tight.

A More Successful Type.

The second principle is illustrated theoretically at Fig. 1 B, and this appears to offer better possibilities of success. In this, f represents the turbine wheel, which is connected with a rotary pump g. The explosion chamber is outlined at h, and this is designed to explode the mixture at rapid intervals. The position of the valves, through which the burning gases pass to the turbine wheel, is shown at i, and k is the spark plug by means of which the charge is exploded. The double valve at l regulates the admission of fuel and air the gas conduit m fitting into that of the air n.

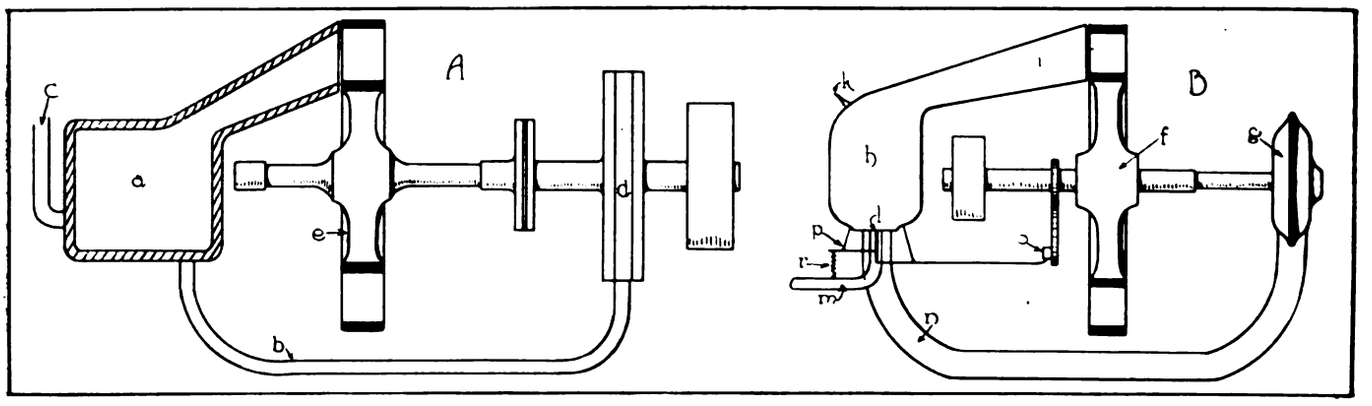


Fig. 1—Theoretical Sketch, Showing Principles of Gas Turbines: A, Simplest Form, or Continuous Burning Type; B, Consecutive Explosion Design.

The construction of this double valve is such that the gas member is situated within the air member. The former is operated by a connection with a cam o, driven by the turbine, while the air valve is worked automatically by the pressure of the exploded mixture, and by means of the lever p and the spring r, which act to hold it open.

The operation of this type of gas turbine is as follows: By turning the turbine wheel by hand a number of times, air is forced through the explosion chamber, valves and flanges of the turbine wheel. After a sufficient number of turns, the gas valve will be opened and gasoline will be drawn into the chamber h, forming the explosive mixture. Immediately after the gas valve is closed, the spark plug ignites this mixture, which expands and closes the air valve. The exploded gas then passes to and through the turbine wheel, causing it to rotate. The air valve remains closed until the pressure of the expanded gas has left the cylinder, at which time it opens again and a new charge of fresh air and gasoline is taken in. This new charge not only has the advantage of driving the rest of the old one into the wheel, but it also has the effect of cooling the chamber and valves, which otherwise would become too hot for continued service.

Multiple Explosion Chambers.

An engine of this type can be operated when the power of the explosions gives a greater turning pressure to the axle of the turbine than is taken up by friction, pump re-

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sistance, etc. In order, however, to obtain a working power surplus it becomes necessary to operate the engine at a much greater speed than is possible with only one explosion chamber. Therefore, a number of chambers is used, sometimes as high as 10. The more chambers employed, the greater surplus of power and the steadier will be this power. It may be pointed out that perhaps the most important feature of any turbine is that the source of power shall be as constant as possible.

There is one difficulty which presents itself with the use of many explosion chambers, and that is with reference to the intense heat engendered, especially when these chambers are within the wheel. It is possible to overcome this by using a water circulation cooling system, in which event the turbine flanged wheel has water chambers. By this plan, much of the water is soon turned to steam, and though the steam is sufficient to cool the surfaces of the flanges, the heat is so great that it is found necessary to employ a large cooler, capable of condensing the steam generated. For this reason, the water circulating plan generally is not satisfactory.

Valve Difficulties.

There also are other difficulties which confront the constructors of this type of gas turbine. Because of the rapid valve action necessary immediately after the explosion, it has been found that only the automatic inlet valve can be used, and even this is difficult to construct in such manner as to yield satisfactory results. The conditions of the automatic inlet valve are much different here than in the gasoline motor of the piston reciprocating type, since in that case it is closed by the compression stroke of the piston. In the turbine this compression does not exist, and the valve must be closed entirely by the pressure of the explosion, and it has been found that they generally are too heavy and complicated in design to be able to close with a speed equal to that of the exploded gas. The result is that the exploded gas passes back through the valve, either igniting the incoming charge or destroying its firing qualities by mixing with it. The difficulty of firing the charge after the valves have closed, and in using a mechanically operated valve, lies in that as the firing mixture has practically a continuous flow, only halted by the explosions, the closing of the valve would allow the gas time to escape into the wheel before the explosion could burn it.

Regulation of Charge.

Another problem is the proper regulation of the gas and air mixture with reference to the different speeds of the engine. Some success has been noted in the use of regulators which control the intake gas valve to the extent of causing it to open wider as the speed of the turbine increases. A device of this nature, which has been used by Friedrich Hansen, Hamburg, Germany, is shown herewith by theoretical drawing at Fig. 2 A.

This device is operated in the following manner: Between the valve spindle s and the cam n is assembled a sliding member e with a cam shaped lower surface. This sliding member is operated as shown in the drawing, by the regulator r, which is in turn driven by the turbine shaft. The backward and forward movement of the member e regulates the size of opening for the valve f, as can be seen in the drawing.

The proportions of the cam surface on the member e represent the different openings of the valve. That portion of this cam to come between the spindle s and the cam n at the highest speed of the motor, and therefore at the greatest opening of the valve, is represented by the dotted line a-b. From b to c represents a movement of the member e when the speed of the turbine has exceeded the normal, in which case the valve opening would be reduced or entirely closed. The curve from b to d represents the different valve openings for empty running and for normal revolutions.

Hansen's Gas Turbine.

A further interesting experiment of Engineer Hansen is illustrated by the drawings at Fig. 2B and C, showing a single drum form of explosion chamber within the turbine wheel. As can be seen at C, the air inlet valve x and the gas inlet y are located within the turbine axle centre. The gasoline is reduced to a spray by being pumped through small openings into the explosion chamber w. The charge is regulated by means of a cam driven by the shaft of the turbine. After a number of trials, the automatic air valve was selected in preference to the mechanically driven member. The exploded gas passes out through eight conduits, designated by z in B and C.

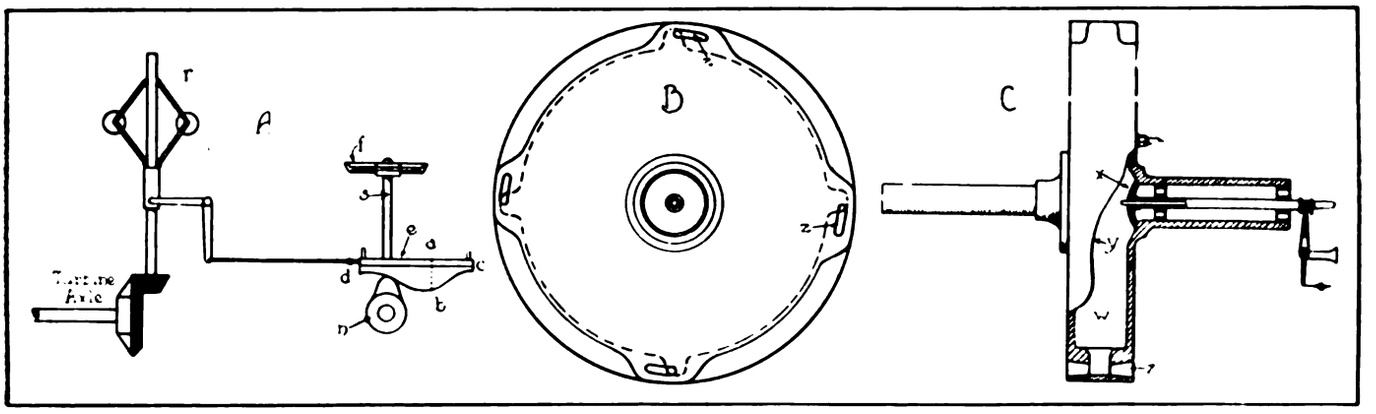


Fig. 2—Theoretical Drawing of Gas Turbine Components: A, Regulator for Controlling Gas Charge; B, End View of Revolving Explosion Chamber; C, Section Through Same.

Under test this turbine is said to have reached a speed of approximately 2500 revolutions a minute with 30 explosions a second. It is stated, however, that the successive rapidity of the explosions appeared to be of a somewhat similar nature to that of a constant burning of the charge. When the turbine had been in operation 30 minutes the ports were red hot, and after an hour's continuous running this heat color had spread on the outside of the casing to a circle near the axle. The heat at this point seemed to have reached its maximum and the color spread no further.

The weight of the turbine wheel was 45 kilograms (about 99 pounds), and it turned on ball bearings of the normal type. The fuel used is said to have been 2780 grams (about a gallon) of kerosene and gasoline an hour. Kerosene could not be used at first, but only after the engine had been running a sufficient length of time to generate the heat necessary to vaporize it.

Pounds Pressure Obtained.

A plotted curve of the pounds pressure obtained by the exploded gas at the different speeds of the successive explosions a second showed between 70 and 80 at one explosion and about 10 for 24. This rapid reduction in the pressure

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of the exploded gas by the increasing number of explosions a second is held to be due to the fact that the speed had the effect of reducing the richness of the charge correspondingly. With a later model of somewhat similar design, Mr. Hansen reports better results. In this instance the power pressure developed was about 70 at six explosions a second and approximately 55 at 18.

Based on the experience obtained by the trials with these models, Mr. Hansen has constructed a new motor, that shown at Fig. 3, with which it is claimed that such practical results have been obtained the inventor feels justified in saying that he will soon be able to offer to the industry a tested, practical gas turbine for automobile and aviation use, well qualified to do the work and to enter the field of competition with present gasoline engines.

This turbine is made up of three cylinders, assembled in such manner, however, that they constitute one revolving explosion chamber. The air intake is arranged for in a similar manner to that described in the previous figure; that is, through the axle of the turbine wheel. The gasoline or kerosene enters through the centre of the air valve, and is forced into the explosion chamber through a spray valve by the pump a at Fig. 3 A.

The explosion operates in reaction valve reversing chambers, passing through the flanged wheel to the open air through the exhaust tube e, seen at the bottom of the casing in B. The spark plug f is used for firing any gas which may escape in the casing of the flanged wheel when the turbine is being started. Spark plug g constitutes the point of friction contact which conveys the firing current to the friction points of the spark plugs, fixed to the explosion chambers, as they revolve with these chambers past the plug g.

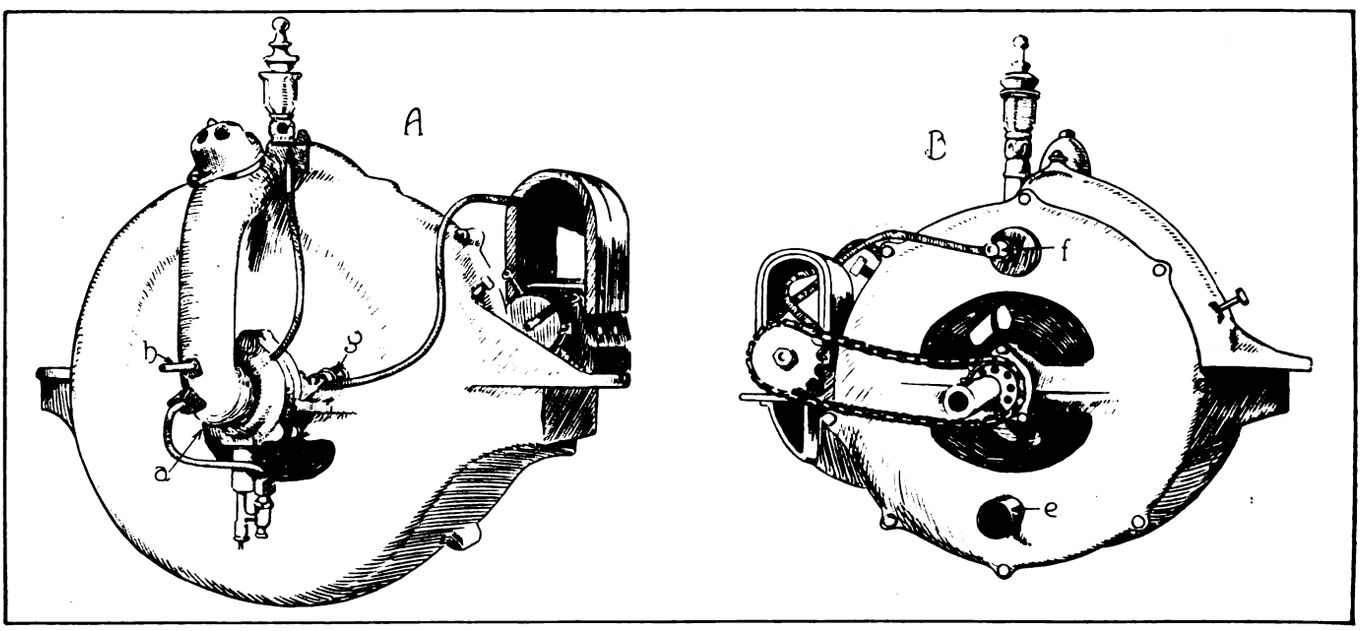


Fig. 3—Inlet and Exhaust Sides of Gas Turbine Constructed by Friedrich Hansen of Hamburg, Germany, and Given Practical Tests.

Method of Cooling.

The rapid revolutions of the chambers, assisted by the ventilator, which also revolves with the main axle, generate a forceful air current which has proved sufficient to keep the power plant cool and in good working condition. The cooling air, which has a pressure of a 24-mm (.94-inch) water column at a turbine speed of 1200 revolutions a minute, is exhausted from the tube h. For the purpose of allowing this cooling air to circulate through the parts, the axle is hollow and connected with the explosion chambers at three points only.

At first, the air which was heated by its circulation through the turbine, was used for the fuel mixture as well, but it was found that cold air must be employed for this purpose, owing to the fact that the hotter was the air the lighter was the fuel mixture. The much greater expansion of the cold air on entering the chambers added materially to the power of the engine, and it was only after making use of this that practical results were attained.

Thus it will be seen that the industry apparently soon will have the opportunity of testing the practical gas turbine, and it may be added that it is to be hoped the results will justify the expectations of many who believe that in this type of motor the ideal power plant is to be realized. Of course it will depend upon how far it is possible to overcome present difficulties of construction in the engine itself, and when these are overcome the question of efficiency with regard to the consumption of fuel will be another important point for consideration.

Considering Power Transmission.

It also may be pointed out that a matter of some importance will be the problem of transmitting the energy, inasmuch as the possibility of constructing a gas turbine of light weight and high power undoubtedly will depend largely upon its high speed ability. It hardly would be practical to employ any of the present types of gear transmission with a very high speed engine in automobile work.

It has been suggested that perhaps this difficulty could be overcome by utilizing electric or oil hydraulics. Electricity would appear to have particular qualifications, as the high speed of the turbine would make it possible to do the work with a comparatively small dynamo of light weight, which in automobiles might be attached directly to the turbine under the hood. This with the storage batteries for reserve, light and heat, and two electric driving motors in the wheels would comprise the entire power plant and transmission mechanism. Or, one electric motor located just behind the dynamo under the front platform extension and connected with the present design of live axle and differential might be used instead of two motors without the differential.

For heavy trucks a combination of a practical gas turbine with the oil hydraulic transmission would appear to offer special advantages. With this system, as with the electric transmission of power, the speed of the car does not depend upon that of the engine. In other words, the speed of the power generator may be kept constant, while an even regular graduation of the increase or decrease in speed of the vehicle is possible.

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AMERICA'S FIRST INDUSTRIAL POWER WAGON.

Novel Power Plant Designed by L. F. N. Baldwin to Drive Furniture Van for Department Store at Order of John Shepard, Jr., of Providence.

WHAT is believed to be the first industrial power wagon constructed in America was built to order for John Shepard, Jr., executive of the Shepard Company, which conducts a department store at Providence, R. I., by the Cruickshank Engine Company of that city, in 1896-7, to designs by L. F. N. Baldwin, the noted racing driver. This vehicle was delivered to the Shepard Company in the late spring of 1897 and was driven about for a considerable period, chiefly for exhibition. The machine was experimental and it was a distinct advance, but because of the defective carburetion and the inability to always secure proper traction with the steel tired wheels, it was not continued in service.

This was not the first power wagon owned by this company. In the winter of 1895-6 Mr. Shepard, who was enthused with the performances of some of the earlier experiments with motor vehicles, had a steam power plant installed in a two-horse express wagon. This machine was used for about three months with some success. It was not a practical construction, however, the power practically wrecking the wheels, so Mr. Shepard decided to have a wagon built that would be the better adapted for the service.

Mr. Baldwin was at that time superintendent for the Cruickshank company. This concern was noted for the quality of steam engines it built and it was naturally to an an expert that Mr. Shepard took his proposition. Mr. Baldwin designed and superintended the building and installation of the steam plant. He drove the steam wagon for a considerable period and, with his experience, was the logical man for the development of the real industrial transport.

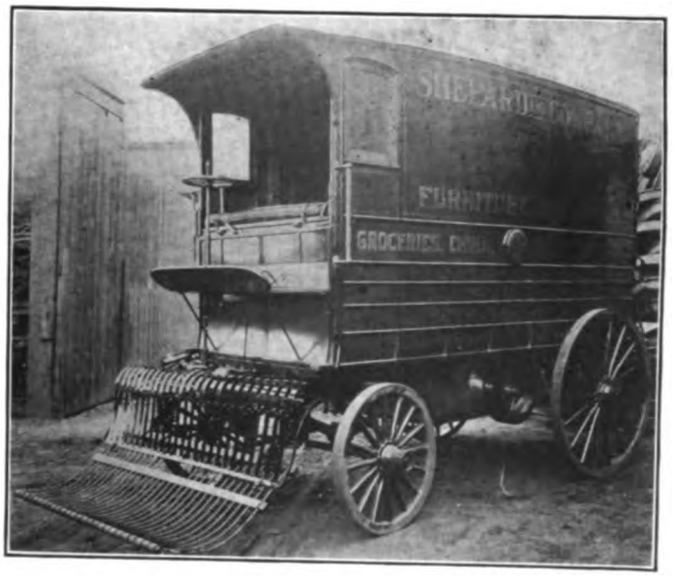
Mr. Shepard wanted the wagon for business purposes and he believed that steam did not offer greater possibilities than did gasoline. He wanted to have his wagon driven by a gasoline motor and proposed that Mr. Baldwin build it. Mr. Baldwin had an abundance of steam experience and was a skilled mechanic whose speciality was experimental work. Accordingly he undertook the job. The work was extended over a considerable period because of experiment and Mr. Baldwin designed an engine and transmission, invented or adapted an ignition system, and turned out a wagon that in general appearance compares favorably with those of today.

It was accepted by Mr. Shepard that wagon construction was no experiment, but he wanted a power plant, and it was toward the development of this agent for propulsion that his endeavors were chiefly directed. The wagon was intended for furniture delivery and the order for the body was given a western body builder. The running gear of the wagon was ordered nearer home, this being to specifications calling for heavier axles, springs, wheels, and other components.

The most important subject with Mr. Baldwin was the motor. It was necessary to install the power plant and all the mechanism below the floor of the body and to insure clearance a horizontal engine was imperative. A compact plant and minimum weight were essential factors. To incorporate these Mr. Baldwin decided to build a two-cylinder four-cycle double-impulse motor that would produce about 25 horsepower. This motor was novel in every sense and was found to be efficient despite the poor carburetion.

The cylinders were designed with liberal water-cooling space, there being about a .375-inch inner wall, an inch water space and a .25-inch outer wall. The cylinder was about 10.5 inches in diameter for nine inches of the length with a bore of 8.5 inches and then the cylinder was contracted to a diameter of 7.5 inches with a bore of five inches. The walls were not contracted at right angles but at an angle of 75 degrees with the walls. The cylinder head was cast integral and this was coned with the lines of the cone rising at an angle of 15 degrees with reference to the cylinder diameter. The angle of the cone coincided with the angle in the cylinder walls.

This gave a construction that, with the cylinder fitting both bores closely, had in the concentric or larger combustion chamber exactly the same area as the smaller or upper combustion chamber, and the coned walls and head were followed by the walls of the piston, this affording a strength that permitted a saving of about 40 per cent. in weight of



America's First Industrial Power Wagon, with Novel Power Plant, Built by L. F. N. Baldwin to Order of John Shepard, Jr., and Fitted with a Street Car Fender.

metal. The angularity of the piston heads was not such as to cause loss of power by a diversion of the direct expansive force. This entailed the placing of the wristpin in the extreme top of the piston and an extremely long piston rod was used, for the length of stroke for each section of the piston was six inches.

The construction necessitated two admission and two exhaust valves for each cylinder, the admission valves being so placed that they were between the cylinders when the motor was set up, and the exhaust valves were on the outer sides. The valves were mechanically operated by pushrods actuated by a camshaft driven by the crankshaft with conventional half time gears, but the admission valves were unique in that they each contained a carbureting device. The ignition was by hot tube, this being regarded as more dependable than any other method the vogue. The admission valves were bolted to bosses on the sides of the cylinders and to these the gasoline was piped from the tank. There was a float chamber with a float and a needle valve to regulate the flow of kerosene and from this an outlet through a spray nozzle into a mixing chamber,

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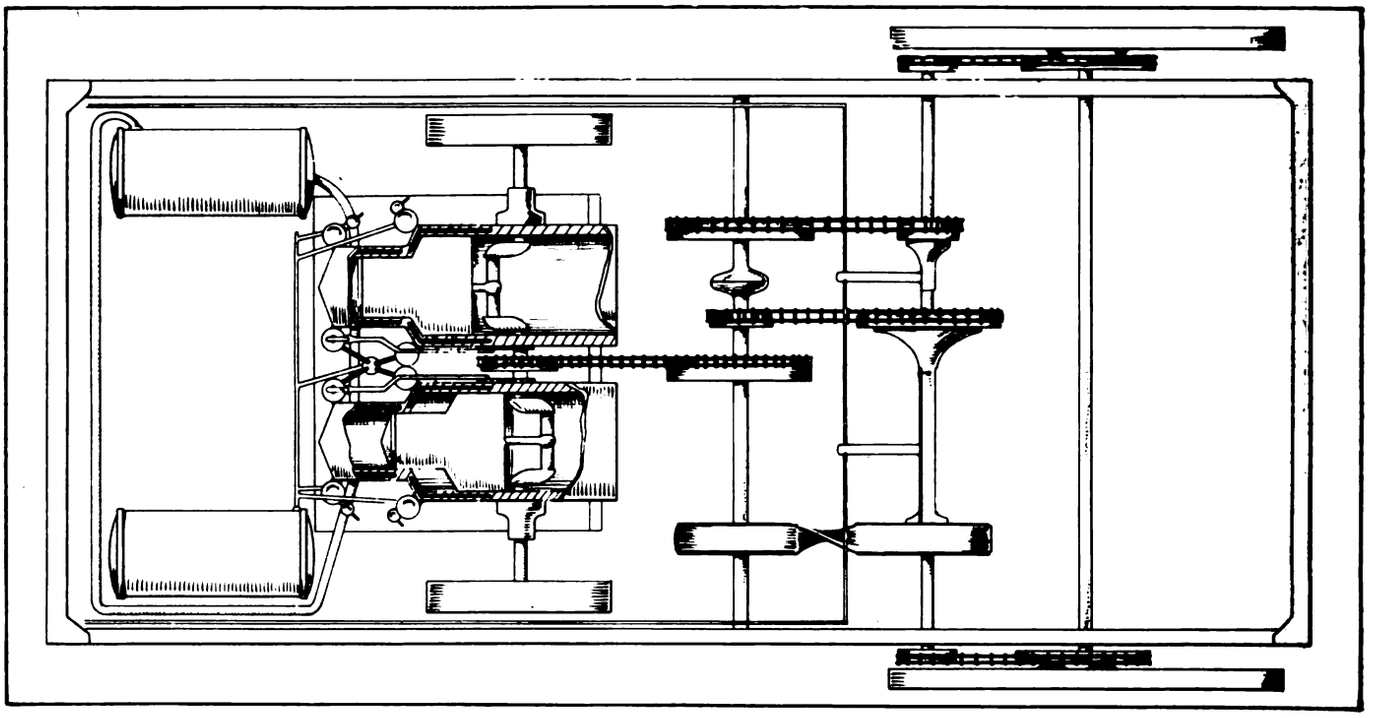
whence the fuel was drawn into the cylinder. While it was possible to regulate the fuel the air intake was fixed and could not be changed, which is a sufficient reason to account for the indifferent carburetion.

The ignition tubes were heated by two primus burners supplied with gasoline from a two-gallon tank by air pressure feed, this being sufficient to last a full day. The tubes were so installed that the pairs for each upper and lower combustion chamber were heated by a single burner.

The motor and the auxiliaries were enclosed in an iron box bolted to the floor of the body. Extending back from the centre of the crankshaft a chain was run. There was a flywheel at either end of the crankshaft, one wheel being shown in the accompanying illustration. The chain from the crankshaft drove a sprocket wheel on a second shaft mounted back of the engine case. This sprocket wheel contained the differential. On this shaft was carried at the left side of the sprocket a pulley six inches in width. At the right side were two sprockets of differing size. Obviously with the engine in motion this shaft was continuously driven by the chain running on the centre sprocket.

reverse with reference to a constant engine speed, and a variance of all three by varying the engine revolutions. From the jackshaft, drive chains extended to sprockets bolted on to the rear wheels. The chains were 1.25-inch pitch, of the type then used for farming machinery, and these were faulty in that they lacked strength and were frequently broken, necessitating delay for repair. The control of the wagon was by a wheel at the top of an upright shaft mounted in front of the driver's seat and by a worm engaging with a fifth wheel on the forward axle.

As will be evident from the description of the carbureting admission valves the supply of fuel was variable, but the flow of air was constant and the fuel feed was regulated from the driver's seat by a lever. At one side of the engine case was carried a fuel tank with about 25 gallons capacity, and at the other side was the water tank of 20 gallons capacity, this serving to radiate the heat. The water tank was of large size, for there was no radiation other than by convection from this tank. No other method for cooling was provided. The floor of the body was removable above the engine to give access for repair or adjustment.



Sketch Giving Approximation of the Two-Cylinder Double-Impulse Motor Power Plant and the Transmission Employed in the Baldwin-Designed Furniture Van Built for John Shepard, Jr., at Providence in 1896-7.

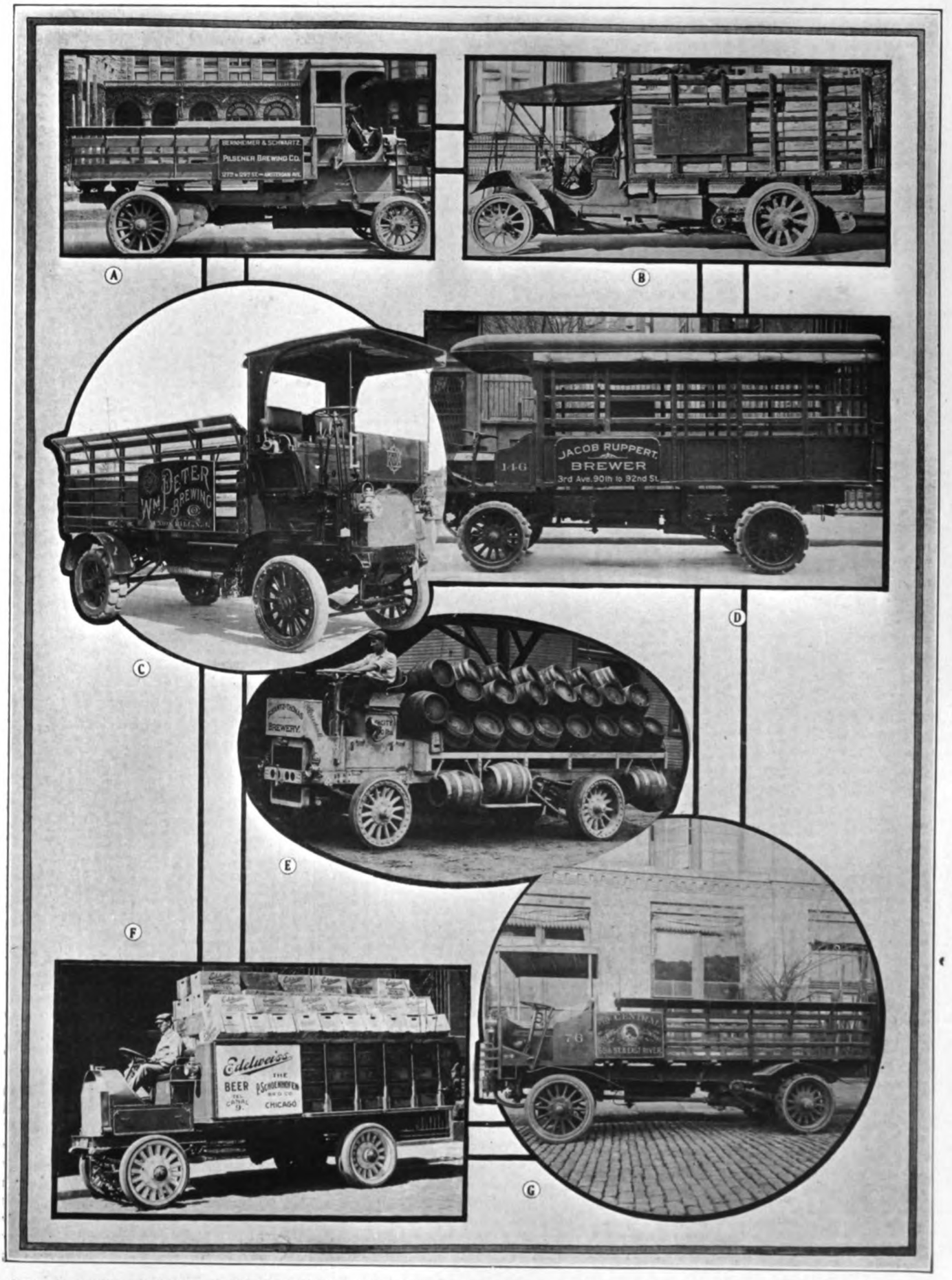
The two sprockets at the right side of the shaft carried chains which were extended to the jackshaft. This jackshaft was much the same as are all shafts of this type in cars of today, having sprockets for the final drive chains at either end. But it differed in that it carried three standard Brown & Sharpe friction pulleys. Two of these at the right side carried sprockets lined with the two sprockets on the first or layshaft, the sprockets being so arranged that the smaller on the first shaft drove the larger on the jackshaft, this being the low speed, and the other two, with reversed proportions, giving the high speed. The six-inch pulley at the left side of the shaft was driven in reverse by a six-inch crossed belt. The friction pulleys were all driven loose on the jackshaft until a speed was desired, when either the low speed or the reverse pulley clutch was engaged by one lever situated at the driver's seat, or the high speed clutch by another lever, and the pulley became fixed and the jackshaft was driven until the clutch was disengaged.

It will be seen that this gave high and low speed and

The engine was designed to give about 25 horsepower, and at times this power was realized, but at other times it was very much lower, much depending upon the carburetion. The pressure in the combustion chambers was low from the fact that hot tube ignition was used and this was also a factor in power. The accompanying illustration shows the wagon equipped with a fender, this equipment being installed by Mr. Shepard, who was then president of the Providence Car Fender Company, and who desired to exploit this device as well as to afford a protection against accident. This was, so far as is known, the first, and perhaps the only, machine ever fitted with such fenders.

The speed of the wagon was normally about 10 miles an hour, but it was possible to vary the speed by changing the sprockets. The wheels were fitted with steel tires and with these on gradients when the roadway was wet, or on wet paving, it was impossible to obtain traction. The engine had power enough to spin the wheels indefinitely, but the wagon was not heavy enough to give anchorage for initial propulsion, though the weight was fully 3000 pounds. The

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Some Examples of Trucks in Brewery Delivery Service: A, Sampson; B, Saurer; C, Mack; D, Hewitt; E, Speedwell; F, Old Reliable; H, Hewitt.

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weight of the power plant was approximately 1900 pounds with the tanks filled. The body capacity was large, the wagon being designed to carry 20 complete bedsteads, with the head and footboards placed across the load space instead of lengthwise.

After the wagon had been used for several months and its limitations had been established, largely from the character of tires and the carburetion, and not from any other mechanical fault, it was laid up and later dismantled, the body now being in existence. While the design was crude and wholly experimental many of the ideas incorporated in it have been demonstrated to have practical value.

In comparison with this first power wagon, it will prove of interest to note the progress made in the construction and application of the industrial transport. To those who have followed the situation in the industry, there may be little need for comment upon the degree of perfection which has been attained. It is sufficient to indicate that it was the recognition of the immense possibilities for service in this type of vehicle, as demonstrated by Mr. Shepard in his determination to secure if possible a satisfactory mechanical conveyance, which has done much to overcome some of the prejudices which have made themselves manifest.

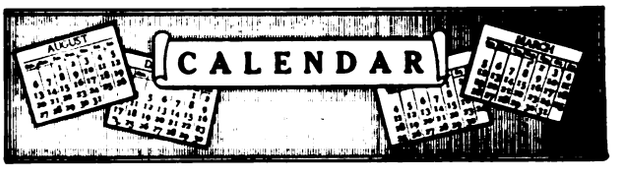
There still remains much of that adherence to custom or habit, continuing what is known to be inimical to every business principle and to every policy, because of unwillingness to take the initiative or to follow the lead of another. But there are certain lines in which endeavor has been made to meet the new conditions, and where there have been many dsirous of following the example which brought about the production of this first commercial motor vehicle.

There are few classes of service in which there is stronger demand for unfailing efficiency than in brewery delivery. In this field, the loads are heavy, the hauls short, much of the travel is on paving, and the deterioration is proportionate to the use. It is recognized that the cost of delivery bears a different relation between the motor truck and the animal conveyance than in some other lines of business. Service, efficient and regular, is the chief aim, although economy is to be considered.

It follows that the motor vehicles which have been used with success in brewery delivery represent at least one of the most satisfactory examples of the best standard practise in modern commercial car construction. The accompanying illustrations show trucks which have seen more or less service in this field in all parts of the country, some in large cities and others in smaller towns. They will furnish ample means of bringing forcibly to mind the splendid progress that has been brought about since Mr. Baldwin's initial attempt to produce an industrial power wagon.

MANY TIRES EXPORTED.

That American made tires are gaining in popularity throughout the world is shown by the large increase in exports during the past year. Tires to the value of $177,210 were exported during the month of November, 1911. Those of the same month in 1910 amounted to $150,214. The export trade for 11 months ending November last, totaled $2,257,727. A comparison with 1910 is not possible as previous to July of that year the government did not list tires separately. The United States Tire Company, New York City, is now sending large consignments monthly to South American ports and also has a flourishing trade in South Africa. The company will take steps to still further increase its foreign business during 1912, establishing branches wherever practical.



COMING EVENTS.

March.

March 2-9 —Pleasure car show, Boston, Mass.
March 2-9 —Show, Norfolk, Va.
March 4-8 —Reliability run, Houston, Tex.
March 4-9 —Show, Des Moines, Ia.
March 4-9 —Show, Reading, Penn.
March 6-9 —Show, Tiffin, O.
March 6-9 —Show, Louisville, Ky.
March 11-16—Show, Cedar Rapids, Ia.
March 12-16—Show, Denver, Col.
March 13-20—Commercial car show, Boston, Mass.
March 16-23—Show, Syracuse, N. Y.
March 25-30—Show, Indianapolis, Ind.

April.

April 27—Speedway meet, Los Angeles, Cal.
April 27—Roadability run, Philadelphia, Penn.

May.

May 4—Road races, Bakersfield, Cal.
May 15-17—Commercial car run, Chicago, Ill.
May 30—500-mile race, Indianapolis, Ind.
May 30—Track events, Salem, N. H.

June.

June 20—Algonquin hill climb, Chicago, Ill.

July.

July 4—Track events, Petersburg, Ind.
July 4-5—Track events, Taylor, Tex.
July 4-6—Beach meet, Old Orchard, Me.
July 15—Reliability run, Wisconsin.

August.

Aug. 8-10—Beach races, Galveston, Tex.
Aug. 23-24—Road races, Elgin, Ill.

September.

Sept. 2—Speedway meet, Indianapolis, Ind.

October.

Oct. 5—Fairmount Park race, Philadelphia, Penn.
Oct. 7-11—Reliability run, Chicago, Ill.

FACTORS IN TIRE EFFICIENCY.

The Motz Tire & Rubber Company, Akron, O., maker of Motz solid and cushion tires, is issuing an interesting booklet entitled, "Multiplying Truck Efficiency." The contents deals with the various tire problems in a practical manner and the pertinent facts are illustrated by half-tone photographs. The commercial and pleasure vehicle types are incorporated.

'VARSITY MEN AND TIRE MAKING.

It is interesting to note the large number of college graduates employed in connection with the automobile industry. According to W. D. Shilts, manager of salesmen of the Goodyear Tire & Rubber Company, Akron, O., many of the leading colleges are represented in the experimental and other departments of the company. Goodyear university men could, it is stated, form a football eleven that would include names very well known on the gridiron.

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ELIMINATING DEAD MILEAGE BY TELEPHONE.

ELIMINATION of dead mileage is a proposition which interests taxicab companies throughout the entire country. While other items undoubtedly enter into the problem of making the taxicab business a paying venture in American cities, some method must be adopted to minimize the number of return trips without fares if the maximum profit is to result. Various plans have been tried in a number of localities, but the satisfactory solution appears difficult to find.



Pittsburg Taxicab Driver Calling Up Central Dispatching Station from Suburban Telephone.

It will be remembered that something over a year ago two or three of the larger taxicab companies in New York City combined forces in an effort to reduce the dead mileage. In this case, dispatching stations were maintained in what is termed the uptown and downtown sections of the city, and when one of the cabs in the downtown section, for example, delivered a fare in the uptown section the driver reported to the nearest uptown station, to which he was attached until occasion might call for his being dispatched to the downtown section again. Under this plan it was necessary to readjust the number of cabs in the respective sections from time to time. The plan was expected to minimize the dead mileage in an appreciable degree, and a later announcement seemed to indicate that such had been the case.

However, many conditions enter into the subject in New York City and while some of these apply as well in other centres, some do not. The situation with respect to dead mileage varies materially in different cities. The topography of the city is an important factor, and the relation of the business to the resident districts quite as much so. Moreover, the situation varies during certain hours of the day, a majority of the traffic being in one direction at one period and entirely the opposite at another, for instance.

Even this condition does not apply to all cities alike. In some centres there is a decided demand for taxicabs during the afternoon and evening and very little if any in the morning. In at least one city a plan was adopted in which a reduction of 33.3 per cent. was granted for taxicab service during the forenoon. It may be stated at once that the scheme proved a decided failure, and with reason.

It costs money to operate taxicabs. If the operation of the vehicle on dead mileage represents a loss, operation at less than cost also represents a loss, and it is possible to have dead mileage even when cut rates are offered, in which case there is a double loss. In addition, it is difficult to make the public understand why it should cost more for a ride in the afternoon than in the morning. As a matter of fact it should not and no taxicab company can afford to operate cars at one time for less money than at another. Obviously some other method must be found for the elimination of dead mileage, since this scheme by no means takes care of the original problem, but creates a new one quite as difficult to solve as the first.

A specific attempt to eliminate dead mileage may be cited in the case of the Pittsburg Taxicab Company, Pittsburg, Penn., which has asked the Bell Telephone Company of that city to assist it in the matter. The scheme has been tried out for the past three months in an experimental way, and has proven so satisfactory that it is to be extended throughout the city.

The Pittsburg Taxicab Company has been organized about 2.5 years, and its experience has been such as to indicate that the average cost of haulage by taxicab in that city is 31 cents a mile. It follows that every mile of dead mileage means 31 cents on the wrong side of the ledger. However, the topography of Pittsburg is such that long money-losing trips practically are eliminated.

An accompanying diagram sets forth this situation. Pittsburg may be described as three towns in one, east end, downtown and north side. Most of the hauls are confined to each locality, and 21 dispatching stations are maintained as indicated by the map. The central station of the company is in the east end. One of the dispatching stations is at Rittenhouse, one at the Pittsburg Athletic Club, another at the Hotel Schenley, and the remainder in the down town and north side sections.

The east end, being the residential section, no difficulty in dispatching is experienced. Calls naturally are sent to the company's office and garage, which is utilized as the centre of this section, but it was in this part of the city that the largest number of long hauls without passengers

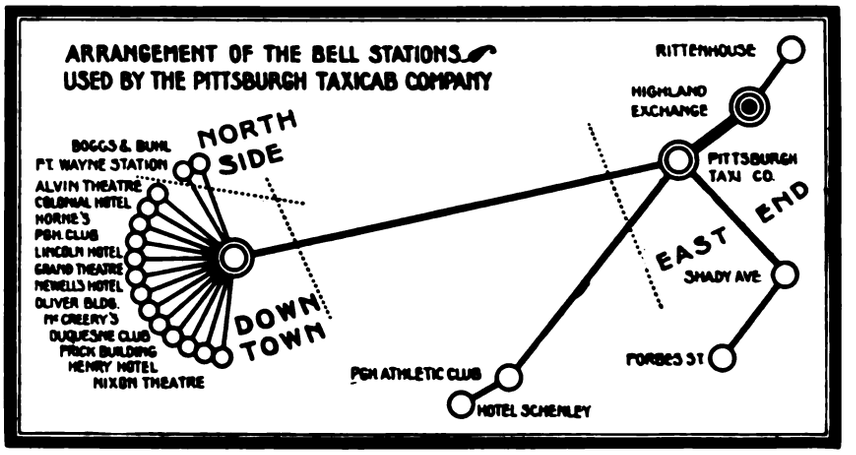


Diagram Indicating Location of Dispatching and Telephone Stations of Pittsburg Taxicab Company.

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occurred. The company decided that the difficulty arose from inability to signal cabs in this residential section.

The telephone company was called into conference, with the result that a Western Union police telephone was placed on a pole at Shady and Northumberland avenues, and another at Murray and Forbes streets. These intersections are quite a distance from the garage and Rittenhouse stations, as will be noted on the map. Each driver was given a key and instructed to make stops at these telephone stations immediately after depositing his fare. If his services were needed in the immediate neighborhood he was dispatched accordingly.

As has been stated, the new system has been in operation for three months, and the results from these two boxes indicates the practicability of installing others throughout the entire city. When the plan is fully worked out it will be possible to have the driver stop at each box on his way back to the nearest dispatching station, and the dispatcher at the private central telephone station of the company will be able to direct him to any fare which may have called in the interim. Manager John W. Weibley of the Pittsburg Taxicab Company anticipates that it will be possible to handle at least 25 more calls during the busy hours under this plan with the same equipment, and that the dead mileage will be reduced to a minimum. Other cities will watch the further experiment with decided interest.

ALCO CREATES NON-STOP RECORD.

What is claimed to be a world's non-stop truck record was established recently by an Alco 3.5-ton truck, made by the American Locomotive Company of New York City. The machine, which is shown in the accompanying illustration, was in constant service for 336 hours without stopping the motor. Originally it was intended to operate the car but a week, but at the end of that time it was decided to continue to better the record of 168 hours established a year ago.



Alco 3.5-Ton Truck Which Participated in a Non-Stop Service for the Adams Express Company of Philadelphia—The Motor Was Run Continuously During the Test.

The machine had been in service over six weeks when it was started to aid the Adams Express Company in handling its Christmas business. Unusually severe weather conditions were experienced but the power wagon adhered to the schedule despite the snow and ice, and made night deliveries to the residential sections of a number of New Jersey cities.

The car performed varied duties and transported on the average about 35,510 pounds of merchandise, travelled approximately 66 miles, made 14 trips and 92 stops daily. The record mileage for one day was 86 and the largest number of trips 22. The largest number of stops made in one day was 104. During the two weeks the automobile covered 922 miles, made 198 trips and 1284 stops, and hauled 441,136 pounds. An average of one gallon of gasoline to an hour of service was maintained. It replaced five two-horse teams and four men accomplished the work assigned to 10 under the horse drawn equipment.

SAYS HORSE WILL NOT BE EXTINCT.

"If every automobile factory in the United States were to double its present capacity, and every machine was a commercial vehicle there would not be enough to take care of the increase alone in our commerce at the present rate of growth, if the government statistics can be taken as a guide," says W. E. Wright, vice president and general manager of the Knox Automobile Company, Springfield, Mass. "The year book of the Department of Agriculture shows a wonderful increase in horse stock. In 1900 there were 15,000,000 horses in the United States and 10 years later, or in 1910, there were 24,000,000 showing a gain of 60 per cent.

"Horses have also increased in value. In 1900 the estimated value of animals utilized on farms was $44 a head, with a steady rise, interrupted only by the panic of 1907. These values increased steadily, until in 1910 the average price was $108, representing a gain of nearly 150 per cent. The value of horses and mules in this country 10 years ago was about $815,000,000, while today it exceeds $3,000,000,000. This evidently does not bear out the assertions made frequently that in 10 years the horse will be extinct, nor does it signify that the manufacture of automobiles is being overdone.

"At the present rate of increase in our commerce, in 1920 it would take nearly 40,000,000 horses to supply the demand. If the horse is to be superseded by trucks or tractors it would take, allowing that one truck will do the work of six horses, 7,000,000 machines, the life of these being estimated at five years. It would require a production of 1,400,000 trucks a year to supersede the horse entirely in 10 years."

FISHBACK COMPANY SEEKS LOCATION.

The Fishback Motor Company, Newark, N. J., which was incorporated recently for $3,000,000, is seeking a factory site, according to a communication received by business men in Youngstown, O., and other places. It is stated that the company proposes to market a line of low priced cars and wagons, and that it will require about six acres of land to accommodate its immediate needs.

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MOTOR TRUCKS IN SHORT HAUL DELIVERY.

Knox Machines in the Service of the City Coal Company, Hartford, Conn., Show a Decided Economy When Contrasted with Animal Carts in Actual Use, Both in Haulage and in Labor, as Well as in Time.

By William W. Scott.

THE cost of any form of transportation is dependent upon the ratio of the total mileage for which revenue is received, provided, of course, that the market price for service is not below what will yield a fair margin of profit. It must be assumed, however, that any haulage enterprise must be reasonably profitable to continue. Many elements enter into expense. These factors are so numerous that it is doubtful that they are ever all recognized, and it may be that even a casual examination will reveal large possibilities for economy. But as practically every business is conducted with some regard to system it may be accepted that the methods employed are reasonably satisfactory.

Regarded purely as a commercial proposition every business man is willing and generally anxious to economize, yet there are many who hesitate to adopt what may appear to them to be experiment. It is needless to say that this apprehension as to results is inherent and many, until there is abundant demonstration, are not willing to employ what has been unquestionably productive with others. The reason for this may be realization that there are no two concerns with methods exactly alike, and yet it may be failure to understand the possibilities.

That in transportation there has been neglect of the exactness of accounting applied to other enterprises no one will deny. The absence of the information that such data would afford is perhaps one of the greatest obstacles encountered by those who study the utility of the power wagon, for generally its service must be contrasted with that of animal transports. It is only when the two classes of haulage are employed that it is possible to make comparison that is valuable, for then it must be evident that the conditions are as nearly at parity as can be conjectured or desired.

An experience that dates from May 6, 1911, with the service of the City Coal Company, Hartford, Conn., in which two Knox trucks are utilized with animal wagons and carts, is decidedly interesting in that it demonstrates there is practical economy in the short haul delivery made, a class of haulage that has always been assumed to minimize the advantage of the larger capacity and increased mobility of the motor truck. The first truck was of four tons capacity, the second, received Sept. 1, was a five-ton machine.



Knox Five-Ton Truck Loaded with Lime and Cement and Its Crew of Driver and Two Helpers.

Delivers From Top of Hill.

As no intelligent conception of the work accomplished can be realized without knowledge of the conditions in which the company transacts its business, it is necessary to state facts which relate to the delivery service in which the trucks are engaged. Hartford is on the west bank of the Connecticut river and on an eminence that slopes in every direction, but more pronouncedly toward the river. The yard of the City Coal Company is in Garden street, very close to the highest point in the city, and the coal is delivered at the yard by train. This coal is in turn sent out to customers. As the loaded carts are sent down hill and the return trips are without loads when the haulage would be hardest it is possible to send out more equal loads throughout the year than would be practical were the conditions reversed. As a mater of fact the company has an advantage in the site of its yard that is worth a great deal of money in the course of a year, and each year this is becoming more valuable.

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To emphasize this it should be stated that the average load of coal carried during the two severe winter months and the three summer months when the temperature is excessive is from 65 to 85 per cent. of the weight hauled under more favorable conditions, as shown by the experience of similar concerns in other parts of the country. Hauling the loads down grade means quicker delivery, longer service for the horses, and generally increase of weight carried. The influence of these factors upon the general proposition is apparent, and it should be understood that this condition is decidedly advantageous to animal haulage.

Sells Coal and Building Material.

The business of the company, however, is not confined to coal, for it deals in lime, cement, brick and similar building material, which is distributed under the conditions stated with the same advantages. While the coal delivery is necessarily restricted to the city, or very nearly so, it is apparent that there is no limitation to the other division of the concern save the facilities for haulage.

The company has maintained a horse equipment that might be regarded as considerably less than the minimum requirements, supplementing this with hired horses and carts as occasion demanded. While this minimized the cost for equipment investment it somewhat increased the expense when animals and wagons were hired because of the profit naturally expected by the owners renting them. In its accounting the company did not, until the purchase of the trucks, make provision to ascertain precisely the cost of animal delivery, and while it has more carefully systematized its records the data has not been computed and arranged so that exact details may be stated. There are other elements that have not been as yet determined. For instance, the record of the horse delivery does not include the cost of investment, interest on the investment, insurance, depreciation, restoration, repair or maintenance, and does include the cost of food, shoeing and the Saturday pay roll. These items are to be supplied in completing the record for the year. With the trucks the five records maintained are insurance, labor, supplies, repairs, sundries, which are to be supplemented at the expiration of the year with the items of investment, interest on investment and depreciation.

Conditions Governing the Business.

For these reasons it is not possible to compile in tabular form what will effectually contrast the work accomplished by the two divisions of the service, nor is it possible to establish the exact cost. But it is entirely practical to make comparisons of the average haulage by the trucks with the maximum possibilities of the animal wagons, which does not by any means indicate the superiority of the former with respect to every detail.

Continuing the consideration of the company's business and its methods it may be stated that practically all the commodities it distributes are received by rail and stored at the yard. In connection with the yard is the stable where 14 horses are kept and these are used for hauling four single and five double-team carts. As to the investment these represent it should be stated that it is estimated that $1000 will purchase a pair of horses, cart, harness and other equipment, all first class. A single horse, wagon, harness, etc., will represent about $600. No provision is made for reserve of horses other than to hire what extra animals and carts and drivers are needed, the price for a double team, cart and man being $5 a day and for a single horse, wagon and man, $3.50 to $3.75. It will be seen that there is a profit made on these prices, but allowing $1 a day for the horses, 50 cents for the wagons and $2 for the man, the items are not excessive. It is estimated, however, that $1 a day an animal will provide for the stabling, feeding, shoeing and veterinary attention and other necessary expenses in connection with the maintenance of horse equipment.



Knox Five-Ton Truck Returning from the Delivery of a Load of Coal Carried in the Bags Shown on the Platform.

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Horse Equipment and Its Work.

The City Coal Company, in systematizing its distribution, loads coal either in bags or loose in chute wagons. The lime is usually in barrels and the cement in barrels or sacks. The proportion of the coal delivered by the chute wagons is not large because of the fact that a comparatively small number of residences are arranged for chute delivery. Coal sent to shops and factories, however, is often by chute wagons. The mileage of the chute wagon, which usually carries full loads, is estimated at 14.7 miles daily. The bag wagons average 17.1 miles daily. This gives weekly mileage of 88.2 and 102.6, respectively. The wagons are sent out with four loads each day, there being one long haul and one short haul each half-day, this being found the better manner of economizing time. Allowing 24 loads a week for each class of wagon it will be seen that the average round-trip mileage for the chute wagon is 3.675, and for the bag wagon 4.275. To expedite delivery and save time a driver and a helper is always sent with either single wagon or team cart and sometimes a driver and two helpers with the larger loads. The maximum load for the single wagon is 3000 pounds and for the team cart 6000 pounds, which figures are rather less than the average loads in other localities, even where the load haulage is heavy. This statement indicates the conditions under which the business of the company was developed.

Turn to Trucks as Economy.

The experience during the summer and autumn of 1910 and the winter of 1910-11 and the expansion of the business were such that the company found it necessary to consider additional delivery facilities. The results of horse haulage were not adequate because the custom for building material was increasing and delivery was so frequently outside the city that the conditions were at times diametrically different when compared with the coal delivery. To send a load of lime or cement to a point five miles distant meant a half-day at least, increasing the delivery cost and lessening the profit. To go nine or 10 miles meant a full day, or nearly so, for a team, cart and two men, and not more than three tons could be hauled. As the market expanded there was increased difficulty of delivery and greater cost.

In considering haulage, taking the standards of a capacity load, a given distance and a stated time for a work the following elements of economy are found:

Capacity Load	Given Distance	Less Time
Capacity Load	Longer Distance	Stated Time
Larger Load	Given Distance	Stated Time
Larger Load	Given Distance	Less Time
Larger Load	Longer Distance	Stated Time
Larger Load	Longer Distance	Less Time

Any one of these factors would be a reason for making such change as would economize expense, and when two or all three could be combined without possibility of failure of results or loss it would appear there could be no doubt as to the decision of a progressive business man.



Knox Four-Ton Truck with Wood Body Adapted for Coal Delivery, It Being Fitted with Rear Chute for Quick Discharge.

Model R Knox and Its Service.

Having had experience with pleasure automobiles and with a practical knowledge of these machines the members of the company decided to purchase a four-ton Knox truck. This was the Model R-16 with wheelbase of 149 inches, 40 horsepower motor, maximum speed of 12 miles an hour, and fitted with a body hoist and a wood body with end gate discharge and chute. A driver employed by the company was sent to Springfield, Mass., to the Knox factory, where he was fully instructed as to driving and caring for the machine. When the truck was delivered he drove it to Hartford and since that time it has been in his care. It was believed best to have a fully competent and trustworthy driver and the result has justified the decision.

The truck was placed in service May 6, and to noon

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February 22 it had been driven 6402.8 miles, as shown by the odometer, and had averaged 156.1 miles weekly during that period. This is about 26 miles daily, or 11.3 miles more than the average mileage for the animal-drawn chute wagon. Considering mileage only it has been driven approximately 75 per cent. further daily than the average horse team and cart, and has a load capacity of four tons as against three, or 33 per cent. more. The reason why this mileage is no greater is that the company started the truck at the same work the wagons are employed for, it being frequently sent out with a load of bag coal, for instance, to make four or five deliveries during a single trip. Of course with the driver and two helpers the distribution is quickly made.

Instances of Excess Work.

The long hauls were made by the truck and of course the greater number of these were with lime and cement. It was utilized for emergency deliveries, which were frequent, because many contractors have their materials sent to them daily, instead of storing a considerable quantity. The reason this plan is adopted is to prevent exposure of lime or cement in the absence of shelter, for rain would cause decided loss. With haulage of this kind the truck could supply sufficient material to the builders that their work might not be delayed, this being a condition that attracted patronage, while with the coal delivery it had equal superiority as compared with animal carts. Without the truck prospective orders outside of the city were sometimes refused because of the cost of delivery, but it was found that a radius of a dozen miles or more could be served with the truck quite as well as the patronage of the city could be met with the old service. The truck speed was governed to 12 miles an hour and care was taken to keep the loads as close to the capacity of the machine as possible. Two initial expenses were $152.75 for insurance and $7 for the registration and driver's license fees, but later the insurance was increased in amount and the registration cost was doubled by an amendment to the state law.

In keeping the expense of the truck under the general head of supplies were entered the items of labor, supplies (gasoline, oil, grease, waste, etc.), repairs and sundries. It was believed that the fixed charges could be learned with exactness at the end of the year, which would serve better than to estimate them. For this reason there is no manner of showing difference between estimated and actual items of expense, which would be a decidedly interesting result.

Second Truck Four Months Later.

After the truck was placed in service it was found so satisfactory that, with the expansion of the business through the additional facilities, it was believed necessary to make further improvement, and this impelled the order for the second truck, which was delivered Sept. 1.

With the receipt of the second machine the item of insurance was somewhat increased. It was also necessary to license both trucks, and this cost $19 and $23 respectively for the four and five-ton vehicles. Beginning with Sept. 1 a new account was inaugurated in which the expenses for the machines were divided for the items of labor, repairs and sundries, and supplies (gasoline, etc.), combined for the two, although the purchases for each truck may be separated later.

While the greater part of the construction work may be assumed to be during the six months beginning May 1 of each year it is begun as early as April 1 and it is continued until nearly if not quite to the end of the year. The family supplies of coal are usually delivered during the late spring and summer, but the shop and mill deliveries are generally to contract and with quantities not greatly varying each week. The last mentioned class of custom and the small and emergency family orders are delivered throughout the winter. From this it will be seen that the



City Coal Company's First Delivery Truck with the Body Elevated to Show the Chassis Equipment.

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building material trade is in least volume during the severe months of winter, and that coal purchasing is not extremely heavy, although the long period of low temperatures since the beginning of the year has caused a heavier business for 1912 than is ordinarily expected.

Week's Work Under Good Conditions.

To illustrate the work that each machine has accomplished the following records are given:

Four-Ton Truck, Oct. 2-7, Inclusive.

Weight, Pounds	Loads	Coal, Pounds	Lime and Cement, Pounds
36,400	5	13,800	22,600
49,500	7	8,000	41,500
24,900	3	22,900	2,000
72,290	9	72,290	
44,420	5	26,520	17,900
59,940	7	59,940	
287,450	36	203,450	84,000

Five-Ton Truck, Oct. 2-7, Inclusive.

Weight, Pounds	Loads	Coal, Pounds	Lime and Cement, Pounds
55,000	6	24,000	31,000
58,100	6	13,000	45,100
44,710	5	22,010	22,700
51,000	5	51,000	
40,300	4	20,000	20,300
55,500	6	24,000	31,500
304,610	32	154,010	150,600

Analyzing these results the following is found:

Four-Ton Truck, Oct. 2-7.

Trips or loads	36
Daily mileage	..
Round trip average mileage	..
Average load, pounds	7985

This is work equal to 48 full loads of 6000 pounds each with a two-horse team and cart, or the work for 12 full days of such equipment, making four trips daily. The three men on the truck were employed the equivalent of 18 full days, and two men on one cart for 12 days would equal 24 days for one man. Thus the truck did the work of two horse outfits and there was the saving of the pay of one man for six days.

Five-Ton Truck, Oct. 2-7.

Trips or loads	32
Daily mileage	..
Round trip average mileage	..
Average load, pounds	9831.5

This is work equal to 51 full loads of 6000 pounds each with a two-horse team and cart, or the work for 12.75 days for such equipment, making four trips daily. The three men on the truck were employed the equivalent of 18 full days, and the two men on a cart for 12.75 days would equal 25.5 days, for one man. The truck in six days did the work two horses would require 12.75 days to perform and the labor was 18 days' work for one man for the truck, equal to 25.5 days with the animal delivery.

Four-Ton Truck, Jan. 9, 10, 11, 12, 13, 15.

Weight, Pounds	Loads	Coal, Pounds	Lime and Cement, Pounds	Mileage
70,930	8	70,930		28.1
60,090	7	60,090		24.3
65,710	8	62,110	3,600	23.4
46,710	6	46,710		21.2
50,780	6	50,780		25.1
49,710	6	33,710	16,000	21.0
343,930	41	324,330	19,600	143.1

Five-Ton Truck, Jan. 16, 17, 18, 19, 20, 22.

Weight, Pounds	Loads	Coal, Pounds	Lime and Cement, Pounds	Mileage
42,000	5	34,000	8,000	26.0
58,750	6	54,000	4,750	24.8
33,200	5	33,200		26.2
37,500	5	37,500		22.4
41,600	5	25,000	16,600	28.7
39,850	5	10,100	29,750	22.7
252,900	31	193,800	59,100	150.8

Making similar analysis the following is found:

Four-Ton Truck, January.

Trips or loads	41
Daily mileage	23.5
Round trip average mileage	3.490
Average load, pounds	8398.5

This is work equal to 58 full loads of 6000 pounds each with a two-horse team and cart, or the work for 14.5 days for such equipment, making four trips daily. The three men on the truck were employed the equivalent of 16 full days, and two men on the animal cart would be the equivalent of 29 days. The truck did the work of two and five-twelfths horse outfits and there was the saving of the pay of one man for 11 days.

Five-Ton Truck, January.

Trips or loads	31
Daily mileage	25.15
Round trip average mileage	4.84
Average load, pounds	8158

This is work equal to 44 full loads of 6000 pounds each with a two-horse team and cart, or the work for 11 days for such equipment, making four trips daily. The three men on the truck were employed the equivalent of 18 full days and two men on the cart would be the equivalent of 22 days for one man. The truck did the work of one and five-sixths horse outfits and there was a saving of the pay of one man for four days.

Comparison of Combined Work.

Combining the work of the trucks for the two periods instanced gives the following:

October period: Work equal to 99 full loads of 6000 pounds each with a two-horse team and cart, or the work for 24.75 days for such equipment, making four trips daily. The men on the trucks were employed the equivalent of 36 full working days. Were the horse carts used the labor would have been equivalent to 49.5 full days for a man. The trucks did the work of two and one-eighth horse outfits each and there was a saving of one man for 13.5 days.

January period: Work equal to 102 full loads of 6000 pounds each with a two-horse team and cart, or the work for 25.5 days for such equipment, making four trips daily. The men on the trucks were employed the equivalent of 36 working days for a single man. Were horses used the labor would have been equivalent to 51 full working days for a man. The trucks did the work of two and seven-twenty-fourths horse outfits each and there was a saving of one man's labor for 15 days.

Cost of Operating Motor Trucks.

Now as to the cost of the trucks. The items of investment, interest, depreciation, insurance, have not been considered. The price of the four-ton Knox chassis is $4000 and the five-ton chassis costs $4500. To these must be added the expense for the body equipment and the delivery. The insurance will average about $175 annually. The expected depreciation is 20 per cent. These will not vary greatly.

The actual cost for using the trucks has been as follows:

Knox Four-Ton Truck.

Date	Labor	Supplies	Repairs	Sundries
May 6 to Sept. 1....	$434.54	$128.13	$ 5.55	$ 4.20
Sept. 1 to Feb. 1....	542.17	*113.57	79.30	**29.75
	$976.71	$241.70	$84.85	$33.95

Knox Five-Ton Truck.

Sept. 1 to Feb. 1....	$687.41	*$113.57	$34.92	***$29.75

*Supplies expense equally divided between the trucks. **$19 for registration and driver's license. ***$23 for registration and driver's license.

Taking up the analysis further it is found that the four-ton truck was in service from May 6 to Feb. 22, when the mileage record was taken, 246 working days and for that

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time the daily average was 26.30, and a weekly average of 157.80, against an average of 102.6 miles weekly for a bag wagon and 88.2 for a chute wagon. The truck compares best with the chute wagon. For a period of 147 days the five-ton truck had an average mileage record of 21.22 and a weekly average of 127.32. Taking the cost of supplies for each truck for the entire period to Feb. 1 the cost was four cents a mile for the four-ton truck and 4.2 cents a mile for the five-ton truck.

The total cost of the four-ton truck for labor, supplies, repairs and sundries, which included the registration and the driver's licenses, was $1337.21 during the period specified, and this was an average of $5.75 a day. The average for the five-ton truck was $6.76, but it will be noted that the charges for labor to the five-ton truck are considerably larger than for the older machine.

In the figures that have been presented it must not be assumed that these were selected with a view of making the best showing that could be made. As a matter of fact the four-ton truck in one week in October had a mileage of 187 miles and carried 281,490 pounds of freight. The January record is probably as good as any that might be noted, though it has been materially exceeded in mileage.

Relative to the five-ton truck: It has a record of 149.9 miles in a week in October, and carrying 313,610 pounds of freight, which exceeds the first period stated, and in a week in January with a mileage of 105.2 miles it delivered 310,070 pounds of freight, or nearly 30 tons more than during the week specified. This will evidence that the quotations have been at least sufficiently economized to be regarded as conservative.

Capacity Loads for Animal Carts.

It will be noted that in every comparison made the work of the trucks has been placed against capacity loads for animal carts, and obviously it is not possible always to send out a full load. Considering this fact it will be understood that the full value of the trucks does not appear on the face of the statements concerning them. There has been no instance where the trucks have not been, with the loads carried, at least the equal of two two-horse cart outfits, and the mileage record shows that they travelled a distance approximately 50 per cent. more. This fact is also important.

One of the great advantages of the trucks is in serving the increased territory. To illustrate: There is one customer at Glastonbury, eight miles from the yard and with a good road the entire distance. A two-horse team will haul three tons to this customer and return to the yard in six hours, but this is practically a day's work for the animals and they can be used but little more, if any, the same day. The five-ton truck will take from five to six tons to the same customer and return in 2.5 hours.

Considering this service on the basis of hauling a ton eight miles, it may be shown as follows:

	Weight Carried	Miles	Time
Two-horse cart	6,000 pounds	8	6 hours
Five-ton truck	12,000 pounds	8	2.5 hours
Equal To			
Two-horse cart	2,000 pounds	8	1.5 hours
Five-ton truck	2,000 pounds	8	25 minutes

In this it will be seen that the truck will carry one ton and deliver it in about 21 per cent. of the time required by the animal cart, assuming the facts stated. With the load at 10,000 pounds the time is increased to 30 minutes for the ton or 25 per cent. of the time required by the horses. In this it will be understood that there is not only the saving of the time of the truck but of the three men who man it, a very material item in the expense of maintaining a delivery system. This quality is emphasized because it has been shown that under the least favorable conditions the trucks are more than equal to two two-horse delivery outfits, while their superiority becomes more and more apparent as the haulage distance is increased.

The first truck is driven by the man who was instructed in its use at the Knox factory and the larger machine is handled by an experienced man who was hired to keep it in order and operative. The company has not yet attained the proportions that would seemingly justify it building a special garage and equipping it with facilities for specially maintaining its trucks, but it would seem that this would be a logical result, as it is probable that one or more trucks will be added this spring. The company has not been disappointed in the vehicles and the delivery has unquestionably been improved.

In connection with this statement the subject of tires is decidedly interesting, but it is not possible to give figures relative to this expense, despite the material mileage of each machine. According to the officials of the company the original shoes are on the four-ton truck and these appear to be not more than half worn. The statement was made with the mileage at 6042.8. There has been no decided wear evidenced on the shoes on the five-ton truck, which had at the same date been driven 3119.8 miles. Perhaps the tire experience has been unusual, but there is no question whatever that there has been a seemingly satisfactory service with a prospect of this continuing for a considerable period, at least.

AMEND MASSACHUSETTS BILL.

The opposition to the proposed Massachusetts bill to limit the weight and speed of commercial vehicles utilized in that state, apparently has had its effect upon the legislative committee as it practically has been agreed that the act shall be amended so that the weight limit shall be 12 tons instead of six. At the hearing, truck owners, dealers, etc., appeared in opposition to the measure. It was agreed to refer the bill to a sub-committee, the latter to meet a committee of truck users.

Regarding tires the protestants against the bill recommended an investigation by experts to obtain adequate data relative to the transportation of freight upon roads and bridges. Figures were submitted by an opponent of the measure, alleging the impractibility of equipping wagons with one inch of tire for each 800 pounds.

STEBBINS ASSIGNED TO NEW YORK.

H. S. Stebbins of the General Motors Truck Company, Detroit, has been assigned to New York as Eastern district manager of the company. The rapidly increasing business in this territory has made this move necessary and Mr. Stebbins will have charge of all interests, both in the development and the administration of the business. He is well known to the industry, especially with respect to transportation, having been for years the traffic manager of the leading railroads, and his experience in this as well as in the commercial car field eminently qualifies him for his new position. He has been traffic manager of the General Motors Truck Company for several years, which position he still retains in connection with his other duties.

SPECIALIZES IN DUMPING WAGONS.

Announcement is made from Harrisburg, Penn., that ground has been broken for a new motor truck factory, in which J. D. Hipple and C. C. Bennett will be interested. It is understood that the product will be of the heavy duty type, and that the company will specialize in vehicles for hauling and dumping coal, sand, building materials, etc.

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CARING FOR THE COMMERCIAL VEHICLE.

THE ACCOMPANYING communication takes up a subject in which the owner of a commercial vehicle has a direct personal interest. The writer, Henry J. Barbour, has long been connected with the Avery Company, Peoria, Ill., which concern has been engaged in the manufacture of industrial transports and tractors for a number of years. The information contained therein is the result of a careful study of conditions which have been presented in the use of these vehicles in various sections of the country and covering a long period. Mr. Barbour therefore speaks with authority, and his consideration of the subject should prove of decided importance to the owner and operator of commercial motor vehicles.

Editor, MOTOR TRUCK,
Sir:

Motor trucks have become recognized as being no longer in the experimental stage. Every day we hear of firms who have discarded the old horse system and accepted the modern power wagon, both for light and heavy haulage, and of success in some new field, in the country as well as in the city. But seldom do we hear of the failure of the motor truck system, and if we do we are almost certain to find some other cause than the vehicle itself. Most manufacturers take great pride in the construction of their product. They try to put into it the best material suited for its special purpose. The machines are built and assembled under the most careful supervision. Men of ability and experience are employed, and after a car is finished it is given a final severe test on the road. Therefore it must be seen that if a machine "falls down" when it gets into active service, it generally is the fault of the man who is driving it.

Usually, the troubles of a motor truck can be traced to poor lubrication, lack of care for the essential parts of the machine, or careless and bad driving. Lubrication is the most important thing with any piece of machinery whose parts moving on one another create friction. It is not possible to eliminate friction entirely, but it can be reduced very materially. The purpose of a lubricant is to do this; to reduce sliding friction to a possible minimum, and it does this by supplying a thin film of viscous fluid between the bearing surfaces.

Generally speaking, there are three kinds of oil used on a motor truck. First, there is a comparatively light oil for the motor and bearings; second, a heavier or non-fluid oil for the gears and wheels, if the latter be fitted with roller bearings, and lastly, a hard oil or grease for the transmission and differential.

Beginning with the engine, we find that inside this cylinder oil is used. It is best to use the oil for which the car was designed, or that recommended by the manufacturer. There are at least half a dozen first class oils on the market, any one of which can be used without anxiety, but all cylinder oils must have the following characteristics:

They must be non-carbonizing; that is, they must not deposit a layer of carbon in the combustion chamber.

They must not become gummy. They must be of the greatest body or viscosity possible, yet permit a uniform feed all the time, regardless of the temperature.

They must be able to retain their normal body while in use, and must not turn into a thin or watery substance.

They must be "slippery" enough to allow all of the working parts to move smoothly, readily and easily.

They must never contain any gritty foreign matter, which will furrow the bearings.

Cylinder oil with these qualities certainly will not cause trouble. When running the engine, always see that the cylinder oil is at the correct height in the crankcase. If there be a circulation pump in the crankcase, it must be in good working order, otherwise the engine is liable to overheat, the piston to stick to the walls of the cylinder, and the result is a burned-out motor, which will have to be rebored, to become of any value.

Not long ago, we received a letter from a man who bought a truck, telling us that he had had great misfortune with his engine. It was his own fault, however. The man had driven 25 miles with a heavy three-ton load, starting with a very small amount of oil. The result was that after going up several sandy hills and traversing about three-quarters of the distance, he found the engine was overheated and there was hardly any lubricant in the crankcase.

Instead of stopping and sending ahead for oil he thought he could make the town, and started to do so. Within about two miles of his destination, he heard an awful crash, and jumping off he found that one of the connecting rods had burned off the crankshaft and had been shoved through the crankcase. The result was a heavy expenditure through his own carelessness. Engines are like people; they must be kept in condition if good work is expected of them.

The next thing to be considered is the oiling of all the small gearings, roller bearings and compression cups. These should be oiled twice a month with a heavy or semi-fluid oil, but not as hard as that used in the larger gearing. Like all oils, this should be free from any gritty matter, and must be able to stick to the gears. On all wheels and the other bearings there will be found oil cups. These should be filled at least once a week with this oil, and screwed down firmly after each trip, so that a new layer of oil is forced upon the bearings each time.

That a tremendous amount of energy is exerted in the heavier gears, such as the transmission and differential, is self-evident. It has been proved that close to half a million foot-pounds are exerted on every tooth of the transmission gears in one minute, when the truck is travelling at a rate of approximately 18 miles an hour. Think of it! A force on each little metal tooth, sufficient to raise 500,000 pounds one foot a minute!

Since this is true, the care and the oiling of the transmission and the differential can be seen to be very important. Without oil, the friction and heat would be terrible. Therefore, an oil of certain good qualities must be used. It must coat the working parts at all times, and absorb the friction. It must cling tenaciously to the gears, regardless of the heat or cold, yet at no time become gummy or resinous.

Another cause of failure in motor truck service, is that due to bad or careless driving and the abuse attending this upon the clutch, brake, chains and tires.

It is bad policy to allow everyone to drive a truck, because each individual drives a car in a little different manner, and the various methods of shifting gears in the transmission, for instance, causes them to wear out quickly. However, if one is careful to have the clutch pedal pushed entirely out, he will have no trouble with the changing of speeds. A great many drivers change speeds with the clutch partly disengaged and stripping the gears is the result. Then, sometimes drivers engage the clutch so quickly that there is a burst of momentum from the car that nearly tears off a tire.

If the clutch be in the habit of gripping, slipping or spinning, it should be attended to at once. Gripping is due to faulty mechanism, too tight spring tension or lack of oil. Slipping is not dangerous, but is the cause of much annoyance, and loss of time and power transmitted to the driving wheel. The causes either are insufficient spring tension or a greasy surface (if the clutch be leather faced.) In the first case, the spring can be tightened, but in the second, French chalk should be used to get rid of the grease. Spinning clutches are so called when the clutch driven shaft continues to revolve after the clutch is disengaged. It causes a series of blows on the teeth of the gears in the transmission, which is very destructive. Some manufacturers fit this member with a clutch brake. The clutch is a most important part of the truck and it should be considered as such. It should be examined and tested once or twice a month, and if it fail to do its duty should be adjusted immediately.

There is an old law in physics which reads something like this: "A body in motion tends to stay in motion; a body at rest tends to stay at rest." This is true of a motor truck. A vehicle in motion tends to stay in motion, and it will do so until stopped by friction, either the friction of its parts or applied friction. Applied friction is furnished by the brakes, and these to be of any value must be effective and dependable.

A large brake surface is desirable. No three-ton truck should have less than 450 square inches of brake surface. A light truck weighing 3000 pounds and running at the rate of 20 miles an hour exerts about 50,000 foot-pounds of energy. To stop this in five seconds means that from 14 to 15 horsepower must be absorbed by the brakes. Braking creates immense heat, and therefore, if the brake surface be small, the pressure a square inch is greater and the brakes are liable to "burn up." The larger the brake surface the less the pressure a square inch, and the less tendency to burn. It also might be said here, that the larger the brake surface the less the brake trouble.

Trucks generally are equipped with two kinds of brakes, the internal expanding and the external contracting, and it should be unnecessary to say that they should be tested and kept in the best of condition. Brakes should be such that the car can be stopped at once, but when the brake is released the bands should not drag. Cotter pins in the brake rods should also be inspected to see that none are lost or broken. If brake surfaces be leather, camel hair or some other belting, oil should not be used on them, but if the surfaces be metal against metal, they should be lubricated to prevent "furrowing."

Brakes should not be overworked or strained unnecessarily. Many truck drivers go as fast as they can until they almost reach the desired spot, then "jam" on all brakes and slide the rear tires. This is absolutely uncalled for. A good, careful driver seldom uses his brake, but slows down gradually. On an incline, it is best to set each set of brakes alternately, but in ordinary driving it is almost unnecessary to use the brakes. All slowing or starting can be done by retarding or advancing the throttle.

Tire trouble is another thing that keeps the cost of a motor truck up, but a heavy tire expense is often due to a poor or careless driver. A few given rules can be laid down for this: Don't allow oil to get on the tires or allow the truck to stand in a puddle of oil. Don't start or stop the car with a jerk. Don't round corners at a high rate of speed. Don't unnecessarily turn sharply. Don't turn the steering wheel while the car is at rest.

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Expense of the rear tires may sometimes be due to the fact that the radius rods are not adjusted an equal amount on each side of the truck, the rear axle is not at right angles to the driving chains and not parallel to the countershaft. Wear on the driving chains will become evident if this be the case. This fault can easily be remedied by tightening or loosening the rods.

More troubles are due to bad driving than to any other cause. It is fool's economy to put a $5-a-week boy on a $5000 truck. Some drivers like to start suddenly and see how big a hole in the road they can make. One large manufacturer says: "The more easily a motor truck is started the better it is for the life of the car." In stopping it is the same. Stop gradually. Don't take a "slide for life." It is dangerous, not only to the driver but to others in the street, for it is certain to cause skidding.

In changing gears, observe the following rules: Throttle down the engine. Disengage the clutch entirely. Shift your gears easily. After the gears are shifted, engage the clutch slowly and advance the throttle until the engine reaches its normal number of revolutions. When you come to a hill, change the higher speed to a lower one as soon as the truck begins to slow down. Don't change speeds after you have stalled the motor. Also, don't change too soon, for that is almost as bad as too late.

Keep your truck as near its original efficiency as possible, and to do this you will have need to use good common sense, and plenty of good oil at all times.

Very truly yours,
HENRY J. BARBOUR.

Peoria, Ill., Feb. 24.

CONTEMPLATES BUILDING SERVICE STATION.

Editor, MOTOR TRUCK,
Sir:

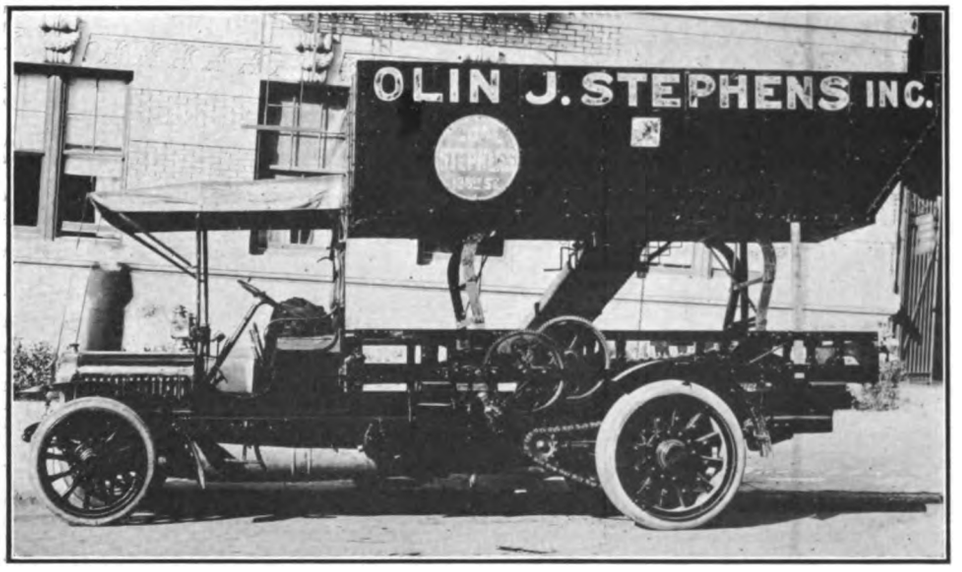
We will build this summer a suitable sales and service building for automobile business in this vicinity in charge of S. H. Daddow, formerly of Youse & Daddow, Reading, Penn. We are interested in garage building construction, machinery and tools, appliances, supplies and accessories for commercial and pleasure cars. We would be pleased to receive literature on any of these lines. Address all communication to S. H. Daddow, St. Clair, Penn.

Yours truly,
MINERS' SUPPLY COMPANY.

St. Clair, Penn., Feb. 28.

ANNUAL MOTOR TRUCK PARADE.

At a meeting of the Motor Truck Club held at the rooms of the Automobile Club of America, New York City, recently, plans were promulgated for the second annual parade of commercial vehicles which will be held Saturday, April 13. It is expected that at least 500 power wagons will participate, as it is estimated that there is at least 50 per cent. more cars in service than a year ago when the first parade was held. The initial event was very successful, despite the inclemency of the weather, and the display did much to demonstrate the efficiency of the automobile for business purposes. The meeting was well attended, there being present a large number of members representing the leading makes of the country and a general committee was appointed consisting of members of all standing committees, and special duties were assigned to the various branches of the committee organization. It is expected that suitable prizes will be provided in the several classes and special inducements will be offered in the way of prizes for loaded machines.



Saurer Truck Fitted with Coal Dumping Body in Service with Olin J. Stephens, Inc., New York City.

TRUCK ECONOMY IN COAL INDUSTRY.

Among the many industries in which the motor propelled vehicle is replacing the horse drawn equipment is the coal business, and those concerns which have given the motor car a trial are discarding the animal and building up fleets of automobiles. The latter has many and distinct advantages over the slower means of transportation, and the most striking is the cost a ton-mile for delivery.

Among the large coal dealers of New York City is Olin J. Stephens, Inc., whose yards are located on 138th street. This concern placed in service a 6.5-ton Saurer truck, made by the Saurer Motor Truck Company, Plainfield, N. J., and equipped with a Wright dumping body, which is shown in the accompanying illustration. Since this machine has been installed it has averaged from 30 to 50 miles a day, carrying a five-ton load.

The dumping body is fitted to a stock chassis and rests upon substantial sills. It is raised to any desired height by a device which obtains its power from the driving shaft, and the mechanism is simple and controlled easily.

Leading from the body is a chute, through which the fuel passes, and it is claimed that a five-ton load of coal may be discharged in seven minutes. This arrangement permits of the car hauling and discharging 10 loads a day or 50 tons. The machine averages from nine to 10 miles an hour and the gasoline consumption is rated at about one gallon to every five miles.

Compared with the former horse drawn equipment there is large gain in favor of the motor car. A two-horse team hauling about three tons, required from 25 to 30 minutes to unload, and in addition it was impossible to chute the coal the same distance as with the machine.

The operator of the automobile is an employee of the company, who drove a team of horses for 16 years. His employer states that his truck cost them less for maintenance than any other, which was due to the excellent care taken of his outfit. He not only inspected the wagon for needed repairs but gave his animals careful attention and always remained at the barn to see that they were fed, watered and cared for properly.

The company believes that the driver of the horse drawn equipment who is considerate of his outfit, will give the same attention to the automobile, and that after becoming familiar with the machine will develop into a better operator than could otherwise be secured. Obviously, this plan makes for decided economy.

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MANUFACTURERS ACT ON OVERLOADING TRUCKS.

ABOUT 40 representatives of prominent commercial motor vehicle manufacturers held a two-day convention in New York, March 4-5, at the headquarters of the National Association of Automobile Manufacturers, Inc., in accordance with a call issued by the commercial vehicle committee of the association. The principal objects of the meeting were to promote better acquaintance among the manufacturers, to discuss trade conditions and to recommend action by the national association looking toward greater uniformity in construction, ratings, warranty and selling methods. Pronounced interest in all questions taken up for discussion was evident and the results of this first general meeting of the trade are most gratifying to the committee.

The following representatives were present: S. D. Waldon, Packard Motor Car Company, presiding; W. E. Metzger, Metzger Motor Car Company; Charles Clifton and H. Kerr Thomas, Pierce-Arrow Motor Car Company; Benjamin Briscoe and Alfred Reeves, United States Motor Company; B. A. Gramm, C. E. Stone and P. K. Dexter, Gramm Motor Truck Company; F. I. Harding, Peerless Motor Car Company; Vincent Link, Universal Motor Truck Company; G. J. Loomis, Speedwell Motor Car Company; Albert L. Pope and W. C. Walker, Pope Manufacturing Company; A. M. Chase, Chase Motor Truck Company; E. O. Sutton, Knox Automobile Company; A. W. Robinson, Locomobile Company of America; A. J. Doty, Lansden Company; Will H. Brown, Mais Motor Truck Company; Walter C. White, White Company; H. F. Flowers and William P. Kennedy, American Locomotive Company; Peter Dumont and George H. Kelly, Baker Motor Vehicle Company; H. S. Diller, Lauth-Juergens Motor Car Company; Morris Grabowsky, Alden Sampson Manufacturing Company; H. S. Stebbins, General Motors Truck Company; C. H. Wallerich, General Industrial & Manufacturing Company; Herbert G. Streat and F. P. Lewis, Knickerbocker Motor Truck Manufacturing Company; J. T. Langhorne, Packard Motor Car Company; E. W. Curtis, Jr., and F. Nelson Carle, General Vehicle Company; David Beecroft; S. V. Norton, B. F. Goodrich Company; C. W. Fletcher, Walter Motor Truck Company; G. A. Hodges, International Motor Company; David S. Ludlum, Autocar Company; H. E. Coffin and R. D. Chapin, Hudson Motor Car Company.

After a short address of welcome by President W. E. Metzger of the N. A. A. M., and a brief talk on trade conditions by Col. Charles Clifton, the meeting was called to order by Mr. Waldon. Following discussions on the different topics, the meeting passed resolutions recommending adoption by the National Association of Automobile Manufacturers of uniform maximum speed ratings with load for motor trucks of different load capacities and uniform weight allowance for the simplest form of body regularly catalogued, as given in the accompanying table:

Table of Maximum Speeds and Loads.

Rating		Miles an	Weights		
Tons	Pounds	Hour	Standard Body (pounds)	Load & Std Body (pounds)	Total Ld-Body-Overload (pounds)
.5	1,000	16	500	1,500	1,700
1	2,000	15	600	2,600	3,000
1.5	3,000	14	700	3,700	4,300
2	4,000	13	800	4,800	5,600
2.5	5,000	12	900	5,900	6,900
3	6,000	11	1000	7,000	8,200
3.5	7,000	10.5	1100	8,100	9,500
4	8,000	10	1200	9,200	10,800
4.5	9,000	9.5	1300	10,300	12,100
5	10,000	9	1400	11,400	13,400
6	12,000	8	1600	13,600	16,000
7	14,000	7	1800	15,800	18,600
8	16,000	6	2000	18,000	21,200
9	18,000	5.5	2200	20,200	23,800
10	20,000	5	2400	22,400	26,400

The question of a standard allowance for occasional overload was given much attention and it was resolved that "in the opinion of the meeting it is inadvisable to encourage the belief that a truck is designed to carry any weight in excess of its rated capacity, or to permit a warranty to apply to any truck which is overloaded." The meeting recommended the preparation of a standard plate for the chassis on which should be stamped the rated capacity of the machine and some such admonition as "Do not overload."

There was considerable discussion regarding the abuse of demonstrations and the advisability of making charges by the day for these, the rate of charge to be based upon the capacity of the trucks. It was the consensus of opinion that such charges should be made, the payments therefor to be refunded upon purchase of the machine. No scale of charges was decided upon.

The desirability of a standard form of warranty was generally agreed upon and after exhaustive discussion of the subject the following form was recommended to the executive committee of the N. A. A. M. for adoption:

STANDARD MOTOR TRUCK WARRANTY.

We warrant the new motor trucks manufactured by us for 90 days after the date of delivery to purchaser, this warranty being limited to the furnishing, in our factory, of such part or parts of the motor truck, as shall, under normal use and service, appear to us to be defective in material or workmanship.

This warranty is limited to the shipment to the purchaser without charge, except for transportation, of the part or parts intended to replace the part or parts which upon their return to us, at our factory, for inspection, we shall have determined were defective, and provided the transportation charges for the part or parts so returned have been prepaid; and provided further that the said failure of said part or parts is shown not to be due to abnormal use, misuse, neglect or accident, occurring after such motor truck shall have been shipped to the purchaser.

We make no warranty whatever in respect to tires, rims, ignition apparatus, lamps, gas tanks, signalling devices, generators, or other trade accessories, inasmuch as the same are usually warranted separately by their respective manufacturers.

The condition of this warranty is such that, if the motor truck to which it applies, is altered or repaired outside our factory, or if it is operated at a speed in excess of its factory-rated speed, or if it is loaded beyond its factory-rated load capacity, then this warranty shall become null and void and our liability under it shall cease.

The number of the motor truck to which this warranty shall apply is .....; and is described as .....

With the object of securing greater uniformity of dimensions in motor truck wheels and bands, it was resolved to recommend that the dimensional tolerances of felloe bands recommended by a technical committee of the Society of Automobile Engineers, after a careful investigation, be adopted by the N. A. A. M. These tolerances are given in a report of the S. A. E. technical committee for February, 1912, as follows:

1 Tolerance in circumference of felloe band shall be as follows.

	Inch	
	Plus	Minus
Before application to wheel	.03125	.03125
After application to wheel	.0625	.03125

Variation from precise measurement shall be uniform over entire width of band.

(This modifies our recommendation in report accepted at the June, 1911, meeting of the society, to meet the requirements of the more extensive manufacture of rigid base tires.)

2 Tolerance in width of felloe band

	Inch	
	Plus	Minus
Up to and including four inches	.03125	.03125
4.0625 to six inches	.046875	.046875
6.0625 to 12 inches	.0625	.0625

3—Variation in trueness of band when placed on surface plate: Band shall touch at all points within .03125 inch up to and including six inches width. Over six inches width within .0625 inch.

4- Variation in thickness of band .006 inch plus or minus.

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5—Trueness to round. The radial tolerance on the wheel when felloe band is applied shall be .0625 inch plus or minus. This plus or minus tolerance must not occur at diametrically opposite points. There shall be no flat spots or kinks in felloe band on the finished wheel.

Resolutions were also passed recommending that the commercial vehicle committee continue work in the direction of securing data on the width and length of chassis frames back of the seat with a view to possible future standardization of bodies for interchangeability on trucks of the same capacity; also toward securing data as to wheel diameters, height of frame or platform from the ground and corresponding heights of railroad cars and loading platforms.

In connection with discussion of the tire and maintenance questions following a very interesting paper on tires read by S. V. Horton, of the B. F. Goodrich Company, and a talk on maintenance guarantees by W. P. Kennedy, the meeting recommended that the committee obtain and classify information regarding tire mileage in cities having widely different street conditions as concerns topography and character of paving.

Contracts and price reductions on quantity orders were touched upon as matters of interest to the trade, but no action was taken. Mr. Waldon made an interesting explanation of the Packard system of reductions on all orders for two to 50 trucks delivered within one year, and the information was developed that one or two other companies have adopted a similar contract plan.

During Tuesday's session a very informative and interesting talk was made by David Beecroft on delivery delays due to traffic congestion in streets and alleys in Chicago and suggested co-operation of the manufacturers with commercial bodies, architects and other interests with a view to providing receiving departments in office buildings and otherwise effecting changes that would enable trucks to make quick deliveries and get away.

The meeting adjourned to reconvene upon call on June 4 next, and on Nov. 7.

PITTSBURG ADOPTS MOTOR DELIVERY.

As in other leading cities automobiles are revolutionizing the delivery systems of the large department stores in Pittsburg, Penn. Horne's, McCreery's, Boggs & Buhl's, Kaufmann's and Rosenbaum's stores are delivering the greater part of their sales by automobiles, while other concerns are experimenting with the more progressive vehicle.

The largest fleet is maintained by the Joseph Horne Company which has utilized power wagons since 1902. A number of White machines, made by the White Company, Cleveland, O., are in service and these are mostly shoed with pneumatic tires. McCreery & Co. maintains six White cars of 1500 pounds capacity and Rosenbaum's store is equipped with vehicles of the same make. As a result of the use of machines a large number of the stables have been reconstructed into garages and some of these are very complete. Regarding the service a member of one of the leading concerns stated that each vehicle replaced two horse drawn equipments.

SAYS ECONOMY IS CONCEDED.

According to Lin McKie, manager of the commercial vehicle department of the Boston branch of the Velie Motor Vehicle Company, Moline, Ill., it is no longer a question of the economy of the truck over the horse drawn equipment. He bases his statements upon observations made at the shows where the question of economy was rarely asked by prospective purchasers. The average business man is convinced of the fact that the automobile is more economical.

WILL CO-OPERATE WITH DEALERS.

Announcement is made by the United States Tire Company, New York City, that in the future it will discontinue the sale of motor car tires direct to the consumer. Notices have been posted in each of the 26 branches, located in the various cities, stating: "The voluntary retirement from the retail field has been under consideration by the officers of the company for some time. In finally declaring itself out of the retail business the company relinquishes a profitable trade, as all its branches have done a big business in dealing direct with the consumer. However, it was argued that this business should rightfully go to dealers in towns where these branches are located." In making the announcement to the trade the company states that it desires to show in a substantial way it appreciates the decidedly friendly attitude dealers have manifested toward the company's lines.

PROPOSE MOTOR STAGE LINE.

An automobile stage line connecting Augusta and Rockland through Washington, Me., is probable, owing to a spirited contest between the towns of Washington and Jefferson to see which will obtain the new interurban trolley road between Rockland and Augusta. For over 100 years a stage line operated by horses has been maintained between Augusta and Washington and it always has done a large business. Of late the equipment has not been equal to the traffic. When it was rumored that the new trolley line would pass through Jefferson rather than Washington business men in the latter town opened negotiations for automobile service.

ANNUAL PRODUCTION OF RUBBER.

The annual production of rubber of all grades is estimated at 75,000 tons, according to the United States Tire Company, New York City. About 50 per cent. of this total is being used in the manufacture of motor car tires and accessories. About 40,000 tons comes from the valley of the Amazon. Rubber has become the largest individual item in point of value in the import trade of the United States, and a concern like the United States Tire Company utilizes thousands of tons each year.

ACETYLENE STARTING DEVICE.

The Imperial Brass Manufacturing Company, Chicago, maker of brass specialties, has brought out two new specialties which were displayed at recent motor car shows. These consist of a gas regulating valve and accelerator pedal. The former is intended for use in regulating the pressure on acetylene systems, either for lighting or in connection with a self-starting attachment. The accelerator pedal consists of a segment of a circle rising just above the floorboard and may be operated with a forward, horizontal motion, during which movement the foot remains in a natural position.

FLANDERS DELIVERY TYPE POPULAR.

There is a growing tendency among retail merchants to adopt the more progressive form of transport, the automobile, which is not only decidedly efficient but economical. According to the Studebaker Corporation, Detroit, maker of the Flanders "20" light delivery vehicle, 1912 will witness a large increase in the use of these machines. This statement is based upon the results obtained at the recent New York shows where orders were taken for 101 cars during one day. The Flanders is fitted with a body specially designed by experts in the Studebaker wagon plant at South Bend.

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RECENT MOTOR VEHICLE PATENTS

Acetylene Generator.

An acetylene generator which is a departure from the usual form is noted in the patent granted Joseph Corroyer, Oakland, Cal. It consists of a removable water dome in which is mounted a turntable valve regulating the dripping of the water to the carbide in the lower vessel. The gas generated is led through a spiral coil attached to the exterior of the device to a bell shaped member which acts as a reservoir and thence to the lights by the usual double openings.

Throttle Mechanism.

A patent has been granted to Charles B. King, Detroit, assignor of one-half to Ora J. Mulford of the same city, for a throttle mechanism which is operated both by lever and pedal, either independently of the other. It consists of a movable, adjustable sleeve attached to the steering post which is slotted. This is fitted with a lug and a pivoted lever, to which the pedal is connected, engages with the sleeve. Another rod is led from the first lever to the throttle of the carburetor.

Spring Clamp.

A device adaptable for use as a repair clamp for vehicle springs has been patented by Owen T. Hawkins, Pomona, Cal. It comprises a U shaped frame, and a member moving longitudinally in recesses of the legs of the frame, and a stationary part, the latter having permanent means for preventing longitudinal movement of the member when in normal position.

Anti-Skidding Attachment.

Charles H. Myers, Franklin, Mass., has patented an anti-skidding attachment, consisting of an oblique tread plate, having relatively diverging and transverse flanges upon the outer face, and inwardly extending flanges at the lateral edges, there being slots through the plate, and side plates so arranged as to engage tread members through the slots. There is also a flexible tension device exerting pressure upon the plates in the direction of the centre of the wheel.

Resilient Wheel.

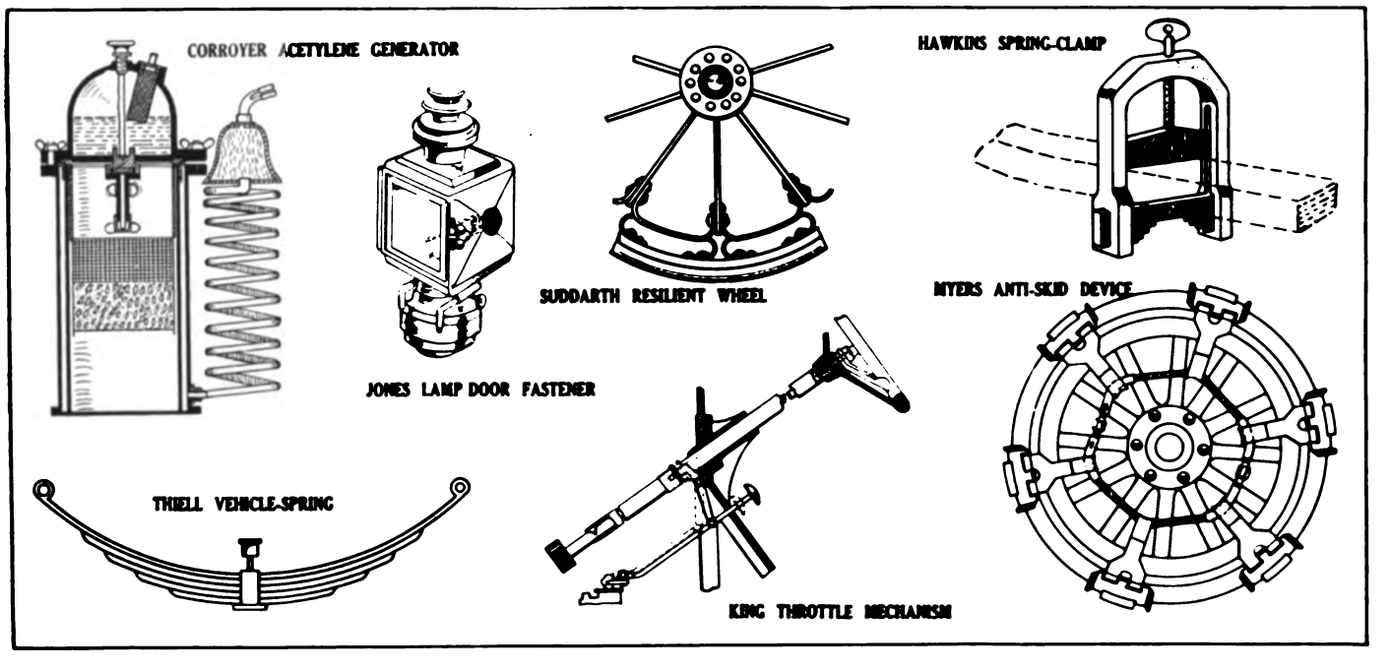
A resilient wheel which utilizes a cushion tire, has been patented by Johnson A. Suddarth, St. Joseph, Mo. One end of the spoke is attached to the hub and the other connected to springs, one side of which is permanently fastened to the rim of the wheel.

Vehicle Spring.

A vehicle spring, the construction of which permits of lubricating the bearing surfaces, has been invented by John S. Thiell, St. Louis, Mo., to whom letters patent have been granted. Each of the series of leaves is fitted with a zigzag groove in its upper face and the members are held together by a bolt having grooves in the opposite sides of the shank portion thereof. The grooves of the latter communicate with those of the leaves and lubricant is fed by means of a cup attached to the bolt.

Lamp Door Fastening.

A lamp door fastening device has been patented by William T. Jones, Detroit, assignor to the Edmund & Jones Manufacturing Company of that city. It comprises a pair of spring arms upon which are mounted spherical members attached to the side of the lamp. A globular member is fastened to the door of the lamp and when the door is closed the globular part is crowded between the spherical members, the latter holding the former securely.



Some Recent Patents of Interest to the Operator, Manufacturer and Dealer, Including Spring Lubricating Device, Anti-Skidding Attachment, Lamp Door Fastener, Throttle Mechanism, Etc.

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The MOTOR TRUCK
Devoted to Motor Driven Business Vehicles of All Classes.

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LIMITING WEIGHT OF TRUCKS.

Manufacturers, owners and prospective purchasers of commercial automobiles cannot fail to be interested in the bill before the Massachusetts Legislature, seeking to limit the weight of vehicles using the highways to six tons. Concerning that portion of the act prohibiting a speed of more than eight miles an hour for cars carrying over four tons, few will be disposed to offer any objection. It would seem, however, that any attempt to restrict the loads carried is a step backward.

It has been pointed out in these columns that certain bridges in some sections of the country districts were not designed to sustain the weights applied to them by the modern methods of transportation. The bill appears to be an effort to transfer the responsibility for damage incurred to these, and incidentally to the truck, from the town to the shoulders of the vehicle owner. Obviously, this is contrary to the established usages. If highways and bridges are incapable of taking care of the increased burden placed upon them it would seem quite the proper thing to reconstruct them.

The importance of the proposed legislation cannot be over-estimated. Massachusetts has set an example for many other states in matters of motoring laws. If this bill is allowed upon the statute books it will mean a decidedly restricted market for cars of more than two or three tons capacity. There can be no good reason for its passage. It does not seem possible that Massachusetts legislators will adopt this radical step, but the situation calls for immediate and effective action.

THE BOSTON SHOW.

Now that the two so-called national motor truck shows have been held, chief interest centres about the first exclusive commercial vehicle show of the Boston dealers. Inasmuch as the pleasure car display in that city always has been considered the largest, most complete and best business exhibition in the country, it is not impossible to forecast the same situation with respect to the industrial transports.

As a matter of history, it may be stated that the first commercial cars purchased and utilized in many of the important cities and towns through New England and the East were purchased at the Boston shows of other years. With an entire week devoted to the exploitation of these vehicles it is not at all unreasonable to assume that this end of the industry will receive a decided awakening in these six states. That the motor truck possesses qualities which fit into the economic problems of these manufacturing communities is well known. All that is needed is an opportunity to bring this home in a direct manner, such as will be afforded by the Boston display.

From the standpoint of the manufacturer or business man who honestly desires to give this problem the best possible consideration, no better opportunity ever has been afforded than that which will present itself in Mechanic's Building, Boston, during the week of March 13-20. One of the largest exhibits of power wagons ever prepared will await his inspection, and with every possibility to study the merits of the respective products side by side. It will be a remarkable assembly of the industry's best representatives, and no business man who desires to keep well informed as to the modern methods of doing business can afford to miss seeing it.

ACCESSIBILITY OF THE POWER PLANT.

Those who have followed closely the new designs brought out during the present show season cannot fail to be impressed with the fact that the manufacturers are devoting a large proportion of their attention to the production of business vehicles which shall present the greatest possible accessibility to working parts. This applies particularly to the power plant, which may be regarded as the chief component of the chassis.

Efficiency of service is the one great aim of the successful truck design. The business man who adopts the mechanically propelled transport to the exclusion of his horse drawn equipment wants to be certain that the newer vehicle will give him at least equally reliable service. Mechanical parts will wear, just as horses will become incapacitated. Present day manufacturers have taken note of this and have arranged to replace the affected part as readily and with the loss of no more time than the replacement of the animal.

Other new features are incorporated into the 1912 designs, but it seems safe to assume that no one subject will attract more attention from the business men than this endeavor to provide for easy, simple and effective replacement and adjustment. In this one respect alone the models offered for the present season are a decided improvement over past design. But accessibility of the power plant is by no means the only progress that may be noted in a careful study of the new vehicles.

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LOCOMOBILE FIVE-TON TRUCK.

Vehicle Designed for Heavy Service and Developed by Long and Careful Experimental Work, Embodying Many Qualities That Commend Themselves to Those Desiring Thoroughly Mechanical and Enduring Construction.

THE advent of the five-ton Locomobile truck at the Madison Square Garden show was the occasion for unusual interest from the fact that it had become generally known that its maker was conducting experiments preliminary to the production of an initial power wagon, although for several years it had built a series of service vehicles that ranged from delivery wagons to ambulances and from police patrols to chemical fire apparatus.

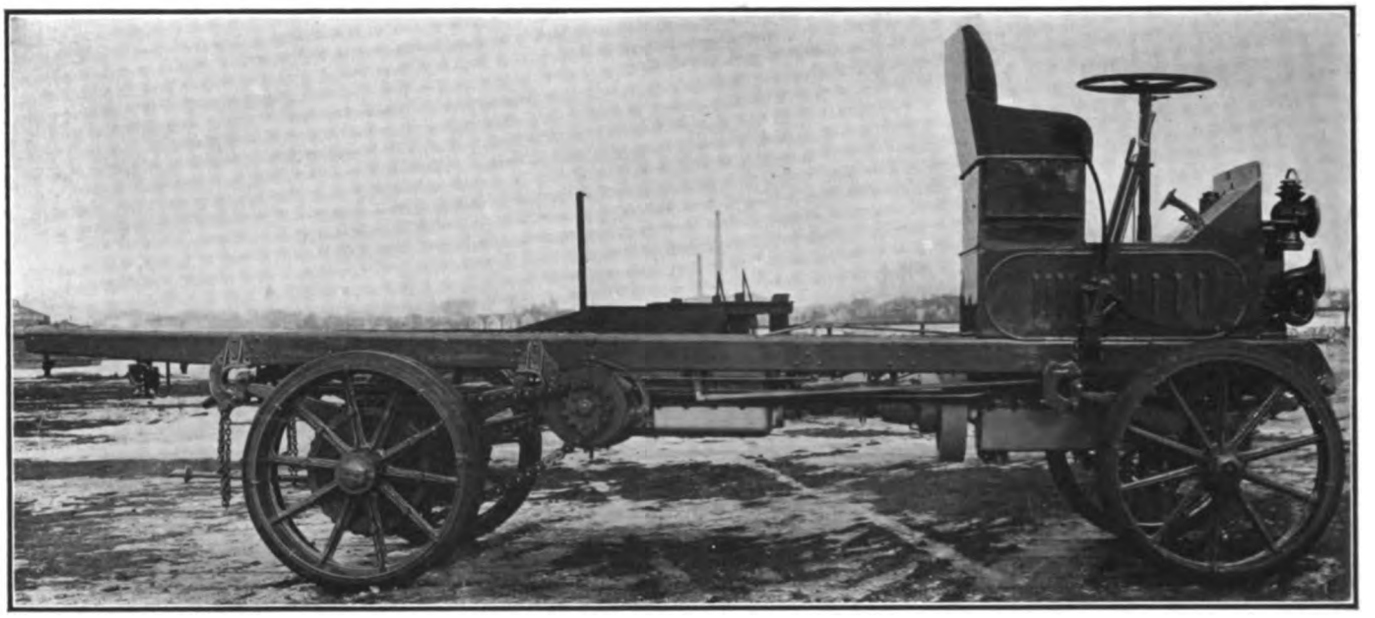
There was decided concern among those in the industry because the Locomobile Company of America, Bridgeport, Conn., is one of the oldest manufacturers of automobile vehicles in this country and it has consistently developed types regarded as typically American. Not since the first machine was marketed in July, 1899, has a car been announced that was not justified in results obtained by the purchasers, and each successive gasoline model has been a development with reference to that which preceded it.

The policy of the company has been to standardize so far as this could be done. Radical changes have never been made. Each production has been distinctly a development in that it has been perfected in detail and carefully refined. The company has an admirably equipped plant and adequate facilities for experimental work and manufacturing, and in A. L. Riker, its chief engineer, has the services of one of the recognized experts of the industry. The Locomobile cars have been looked upon among the standards of the motoring world. They have been known for the care in designing, the quality of material, the character of workmanship and the excellence of finish, the machines harmonizing in appearance and in detail.

In the production of this truck have been combined the results of the long experience of the engineers in designing the differing vehicles built and the data obtained in an exceedingly careful investigation of service wagons and the conditions of their use, this including mechanical practise and commercial methods and usage. The capacity of the truck was decided as being approximately what would best serve the requirements of those engaged in heavy haulage and upon this foundation the design was created and developed. In developing this design every known condition was inquired into and this caused the establishment of factors of safety beyond any question and of construction that would endure under the stresses of hard and continuous industrial service. The purpose was to build a vehicle that would endure such usage at minimum cost and attention.

Truck Design Evidences Progression.

In the design decided progression is evident. This does not mean application of new principles, but the combining and harmonizing of what has been proven and will make for reliability. As an example of sound engineering practise the truck is worthy the attention of every person interested in haulage. Every detail has been worked out thoroughly, and strength, safety, simplicity, accessibility and certainty of operation and control are factors impressed upon those who have examined the machines. Nothing designed for pleasure car construction is used in the truck. It is compactly built and yet has a body platform of large area. The maximum carrying capacity for the wheelbase is insured, the truck may be turned in a radius of 27.5 feet, the view of the driver is perfectly clear, and the operation of the machine has been so simplified that the greatest endurance and reliability has been afforded.



Locomobile Five-Ton Truck Chassis Without Body Equipment, With the Superstructure Covering Motor and Containing Driver's Seat Installed.

One quality believed to be realized to an unusual degree is balance or equalization, this not only with reference to the rotating or reciprocating parts but to the relation of size to ease of handling, of power to strength, to the balance between weight and load, and the distribution of weight when loaded or unloaded. The dimensions of the chassis are as follows: Wheelbase, 140 inches; forward tread, 65 inches; rear tread, 70 inches; length overall, 226.25 inches; width over hub caps, 85.75 inches; platform length, 14 feet; platform width, six feet (or wider); frame

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Head-On View of Locomobile Five-Ton Truck, Showing the Ventilated Forward Frame Member Protecting the Radiator, the Front Wheels and Axle, and the Superstructure.

height above ground when loaded, 39.5 inches; platform height above ground when loaded, 46 inches; driver's seat above ground when loaded, 72 inches. When loaded properly the rear wheels sustain about 70 per cent. of the weight, this being a result when a capacity freight is carried. When light the rear wheels carry about 55 per cent. of the truck's weight. This distribution is believed to be the best that can be incorporated in truck design from the viewpoint of securing sufficient tractive effort, minimizing load resistance, equalizing tire wear and insuring ease of control.

Heavy Duty 45 Horsepower Motor.

The motor is a heavy duty type with four water-cooled cylinders with bore of five inches and stroke of six inches, developing 45 horsepower at 900 revolutions a minute, which is the maximum speed intended for this engine. While it bears a resemblance to Locomobile automobile motors it differs materially as to proportions and means of installation. It is heavily built throughout, for this means endurance and efficiency.

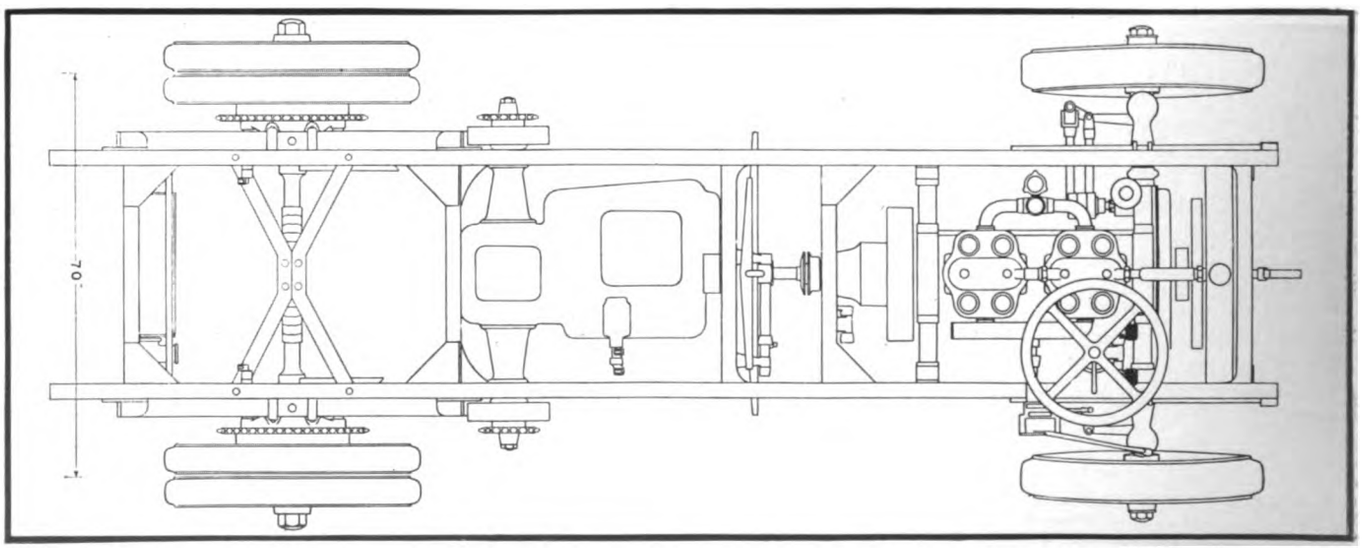
The T type cylinders are cast in pairs from a fine quality of gray iron and with the water jackets integral. The jacket spaces are liberal to insure efficient cooling and the water outlet manifold is integral with each cylinder unit cap and extends longitudinally along the cap, the caps being respectively front and rear with reference to the form of the manifold. This construction eliminates the possibility of leaky joints as sometimes experienced with the separate manifold. These manifolds are connected between the cylinder units by a large hose section. The cylinder castings are bored, reamed and ground to finish. The pistons are of the same material and similarly turned and ground to size. The pistons are grooved for four rings installed above the wristpin. These rings are .25 inch in width and after annealing to relieve them of all internal stress are carefully ground to an exact fit. The crankcase, as is the practise of the Locomobile company, is a bronze casting divided longitudinally, the upper section carrying the main and camshaft bearings. This construction insures absolute alignment of the main bearings and avoids any possibility of crystallization of the metal from the vibratory stresses from road shocks. The lower section of the crankcase forms a reservoir for the lubricant and when it has been removed the crankshaft, main bearings, camshaft, camshaft bearings and the big ends of the connecting rods may be examined or worked upon.

Five Main Engine Bearings.

The crankshaft is 2.5 inches in diameter and is mounted on five main bearings solidly anchored in the cross webs of the upper section of the crankcase, the journals being secured by lock washer, plain nut, castellated locknut and cotter pin for each bearing. These crankshaft bearings have a projected bearing area of 41.34 square inches which reduces the pressure a square inch of projected bearing to a minimum. This large bearing area makes for a longer life for the bearings and lessened motor troubles.

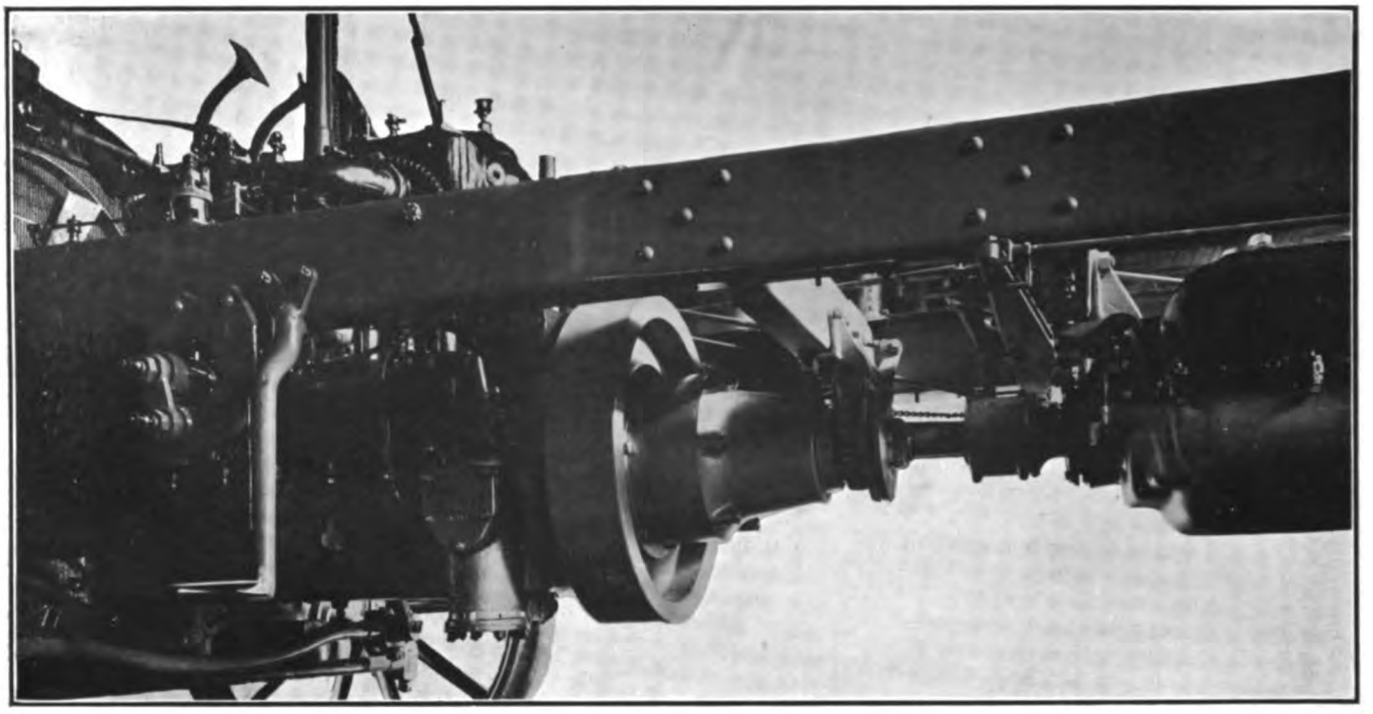
Generous Water Circulating System.

The cooling system is absolutely positive. The radiator is large and the water jackets and pipe connections so generous that eight gallons of water are required to fill them. The water is circulated slowly by a rotary pump located on the exhaust side of the crankcase at a point midway between the cylinder units and driven by an outside shaft from the timing gear. The water is forced into the cylinders at a point at the base of the exhaust valve chambers, thence it is circulated through the water jackets and from the heads of the cylinder units. The water connections are not perfectly rigid and are not subjected to the stresses of intense heat or vibrations. The radiator is mounted in the chassis frame on large rubber buffers and is behind a heavy cross member for protection, this member being perforated



Plan View of the Locomobile Five-Ton Truck Chassis, Showing the Relations of the Different Components.

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Section of Chassis of Locomobile Five-Ton Truck from the Middle of the Transmission Case Forward, Including the Clutch and Power Plant.

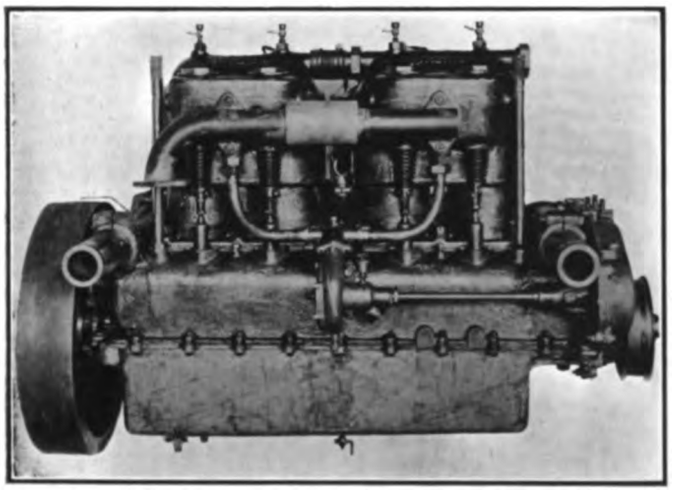
with large circular holes to prevent the reduction of the radiating draft through the radiator. Mounted on the front cylinder of the motor is a bracket in which is an eccentric case carrying two ball bearings, in which the shaft carrying the large one-piece aluminum fan is installed. The fan is driven by a 1.75-inch flat belt from a pulley on the crankshaft extension. By loosening a nut the eccentric may be turned and the fan belt adjusted.

Connecting Rods and Their Bushings.

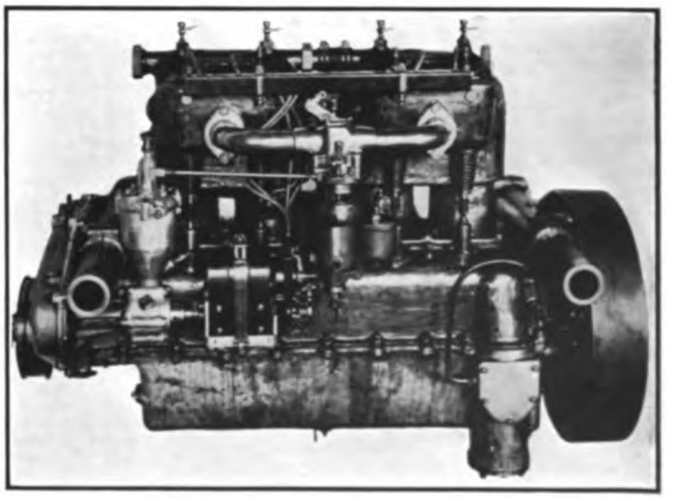
The connecting rods are I section drop forgings and of steel having such strength that the factor of safety is 25. The big end and wristpin bearings are very large and are proportioned to the main bearings. The big end bearings are carried in caps that are held by the same means as are the main bearings. The valve action is conventional, the valves being actuated by right and left camshafts driven by spiral gears from the crankshaft and the valves are large and afford certain inlet of fuel gas and the exhaust of the burned gases. The valve stem guides are cast separately and forced into the cylinder units, this allowing replacement should they become worn. The exhaust manifold is in two parts, one telescoping within the other, this eliminating any stress between the cylinder units from longitudinal expansion, which might change the alignment of the wristpin and crank pin bearings.

Standard Locomobile Design Carburetor.

The carburetor is the standard Locomobile design, being of the float feed type and is fitted with both hot water jacket and a hot air regulator. Only a single jet is used, this insuring ease in starting, but this single jet through its design has the functions of both the single and multiple type jets. The results are the high economy and the satisfaction inherent of the design. No automatic devices have been added. With both hot water jacket and hot air regulator low specific gravity fuels may be used with excellent results, and the hot air regulator has an adjustable opening for the intake of cool air in summer. The carburetor requires no attention from the driver. It is very flexible and affords good mixtures at all speeds. It is controlled by a lever on a quadrant located on the dash.

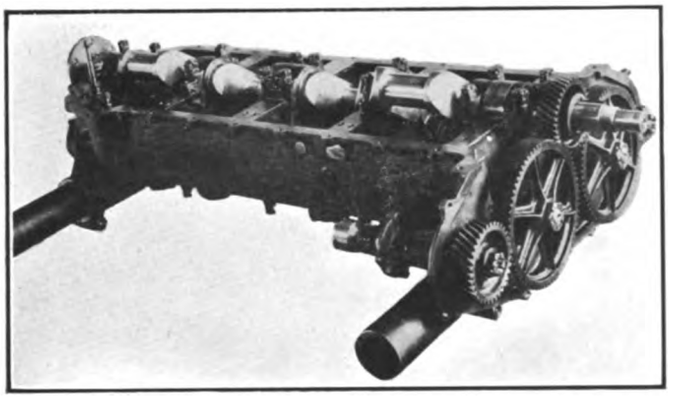


Exhaust Side of the Locomobile Truck Motor, the Water Inlet Being Around the Exhaust Valves and the Telescopic Exhaust Pipe Connection.



Inlet Side of the Locomobile Truck Motor with Governor, Magneto, Carburetor and Oil Pump, and Showing Heavy Supporting Tubes.

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Upper Half of Locomobile Truck Motor Crankcase, Displaying the Five Large Main Bearings, the Manner of Retaining Them, the Crankshaft and the Timing Gears.

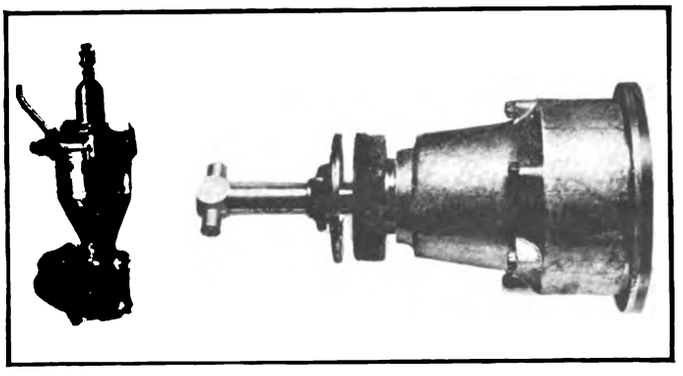
The speed of the motor is limited to 900 revolutions a minute by a specially designed ring governor located at the left side of the motor in front of the magneto. It is of the vertical ring type and is driven off the magneto drive shaft by spiral gearing. The governor ring is mounted on the shaft at a normal inclination to the horizontal plane of 53 degrees and is supported by two cams. It is held normal by a spring, but as the speed of the motor is increased the resistance of the spring tension is overcome and the ring approaches a more nearly horizontal position. After the governor has been adjusted it is sealed that it cannot be changed. The governor prevents speed, which is far more dangerous than overloading, and it assures the owner that the vehicle is not abused. The ring governor was adopted because the ring could be machined to insure perfect balance, as an imperfectly balanced ring would cause vibrations at high speed that would impair the efficiency of the device. The governor is connected by linkage with a butterfly valve in the carburetor which remains wide open at all speeds of the engine until 900 revolutions a minute have been attained. Then the governor operates and the valve is operated, and the supply of fuel controlled.

Unfailing Flow of Lubricant.

The system for lubricating the motor is decidedly efficient, it being self-contained and continuous in operation, combining both splash from the reservoir in the base of the crankcase and force feed from a gear-driven positive pump. This system has the advantage that it cannot be changed by the operator and it will supply a constant and unvarying flow of lubricant. There is no possibility for failure unless there be neglect to replenish the oil, which is a remote possibility.

Motor Rigidly Supported in Frame.

The motor assembly is firmly and rigidly supported at either end in the chassis frame in a manner that is simple,

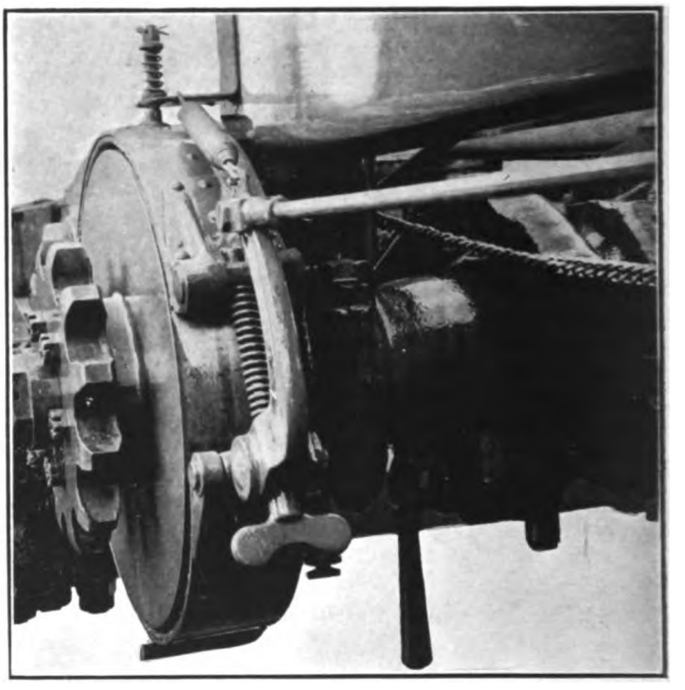


The Governor of the Locomobile Five-Ton Truck Motor and the Dry Plate Clutch of the Driving System.

insures ease in removal and makes certain that upon replacement the motor will be in positive alignment. At either end of the crankcase are heavy lugs through which holes are bored. Two steel tubes, three inches in diameter, are passed through these holes, as may be noted from the illustrations of the motor, and are clamped upon the tubes by clamping bolts. The ends of the tubes are seated in cast steel bearing brackets which are bolted into the chassis frame after the motor has been perfectly aligned, and are retained in these bearing brackets by caps that are bolted firmly. This installation eliminates all strains upon the crankcase and the motor assembly may easily be removed from the chassis should this be necessary.

Dry Disc Clutch Makes Ease in Starting.

The flywheel is exposed and this carries the self-contained dry disc clutch. This construction insures against the plates becoming misaligned. The connection with the transmission gearset is by a driving shaft that has a universal action. This form of clutch has been adopted as being better adapted to withstand the heavy stresses of starting a load from rest than is a cone clutch. The clutch is composed of seven driving discs that engage with six hard-



Right End of the Jackshaft of the Locomobile Five-Ton Truck, the Large Service Brake Drum and Band of the Forward Driving Sprocket.

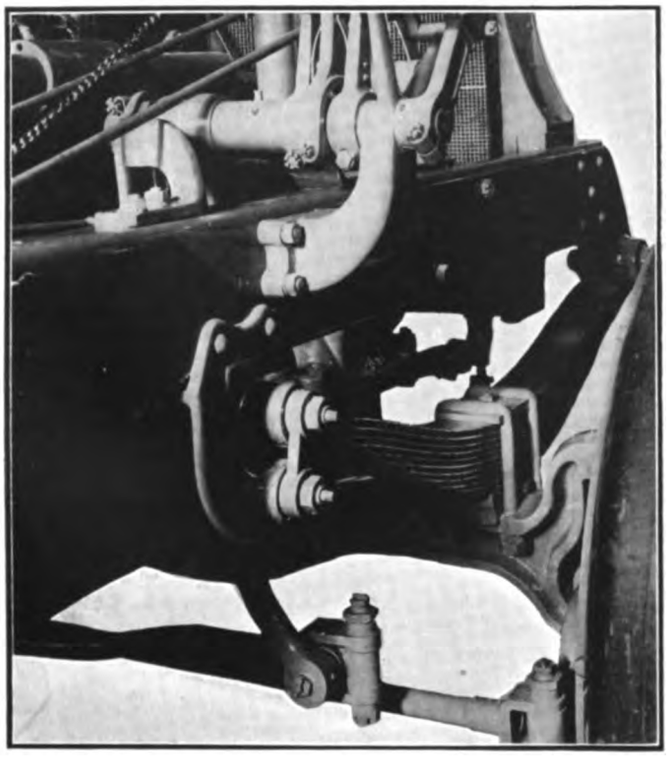
ened and ground driving bolts attached to the clutch drum bolted to the flywheel. These discs are of .125-inch sheet steel, carefully hardened and perfectly faced by grinding. The seven driven discs, mounted on the clutch disc retainer, are of the same thickness and metal as the driving discs, but are faced at either side with a non-burning heat-resisting material .16 inch thick. The clutch is extremely powerful, is easily released because of the small number of frictional surfaces, may be removed with comparative ease without dismantling other components, and requires practically no attention. The driven members have been made light to minimize "spinning" when the clutch has been released. The clutch is also provided with a brake to better control it.

Heavy Transmission Case and Assembly.

The transmission is cleverly designed and powerful and is constructed to endure hard service. Reversing common practise the upper half of the case is supported by the frame and in this are mounted the clutch pinion, main shaft and countershaft, these being retained by collars. The case is

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of manganese bronze having a tensile strength in excess of 68,000 pounds to the square inch. The bottom section is really an aluminum oil pan which is bolted on. This pan



Forward Suspension of the Locomobile Five-Ton Truck, Illustrating the Wheel Control, Steering, Connecting and Tierods, Front Axle Section and Spring, Spring Clips and Spring Shackles.

may be removed to inspect the transmission, and the clutch pinion, main shaft or countershaft may be removed without dropping the transmission or removing other parts. The case is hinged in front to a channel section cross member and is supported behind by the jackshaft housings, which are bolted to it to form an integral part. These jackshaft housings are held by spherical bearings in cast steel brackets bolted to the chassis side members. This construction prevents any distortion of the chassis straining or in any manner affecting the transmission, as the transmission case will adjust itself in the spherical bearings. All shafts and members of the transmission are mounted in extra large roller bearings save the outer bearings of the jackshaft, which are of the annular ball type. The transmission gearset is selective with four forward speeds and reverse. The transmission gears have faces 1.5 inches wide. They are generated on a gear shaper instead of being milled, so that frictional losses are minimized. The countershaft gears are bolted to the ground faces of flanges, the shaft and flanges being cut from solid metal. The main shaft, instead of being square, has feather keys cut from the solid this giving a greater cross section and increased strength. This design and construction produces a transmission assembly that will endure extremely heavy service with a margin of safety far in excess of all needs.

The jackshafts are, like the main and countershafts, with large cross section and are of a special alloy steel. The squared ends of shafts fit into the differential bevel gears. The outer ends are tapered and on these ends are mounted the service brake drums to which the front drive sprockets are bolted. In the right housing is a compact and strong differential lock so that both wheels may be driven as one in the event of necessity, should but one wheel have good traction. The service brake is actuated by a foot lever. The service brake drums are 13.5 inches in diameter and three inches wide, about which brake bands contract. This brake has a frictional area of 255 square inches and because of the chain reduction has as much efficiency upon the rear wheels as has the internal expanding emergency brake. The emergency brake drums are 18 inches in diameter, 4.5 inches face, with frictional area of 355 square inches. These drums are within the cast steel sprocket drums and are firmly bolted to the rear wheels. Both brakes are equalized and either will hold the truck with a full load on much steeper grades than would ordinarily be traversed.

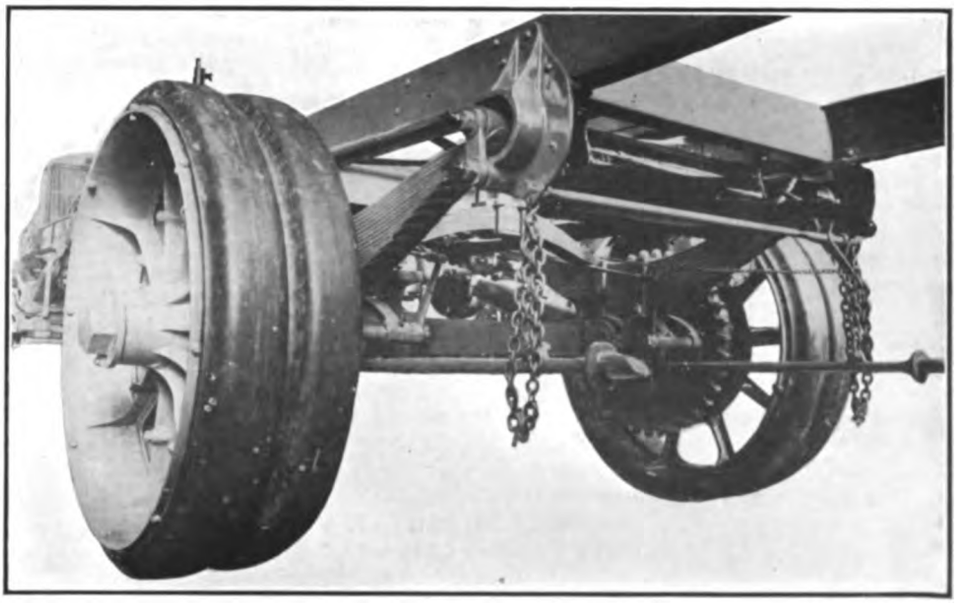
Drive Chains and Distance Rods.

The drive is by double side chain of two-inch pitch with rollers 1.125 inches in diameter and 1.25 inches wide, with strength of 44,000 pounds, with 12-tooth front and 35-tooth rear sprockets. The sprocket reduction of the truck exhibited is 2.92 to one and the reduction on fourth speed between the motor and rear wheels is 12.8 to one.

The relation of the rear axle to the jackshaft is preserved by heavy distance rods mounted at either side of the chassis frame. These rods are channel section and are bored and bushed at the rear ends to fit the rear axle. The forward ends are fitted with adjustable bronze bushings in which are swivelled yokes, the forks of which fit around and are bolted to bosses on the jackshaft brackets. This construction permits chain adjusting, and serving as universal connections the rod is relieved of undue stresses, while the springs are protected against the driving strain. The rear axle is of alloy steel, 3.5 inches deep and 2.5 inches thick.

Wheels and Springs.

The wheels are mounted on roller bearings of far



Rear View of the Locomobile Five-Ton Chassis, Displaying the Heavy Frame Construction, the Wheels, Springs, Jack Spring, Brake Drum, Rear Sprocket, Spring Shackles, and Sprags.

greater capacity than they will ever be subjected to, being guaranteed to resist at the rear wheels 17,000 pounds to the axle, which will not be reached under the heaviest over-

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load, while their size minimizes the wear. The spring saddles are fitted around the rear axle and from these the emergency brake shoes are supported, this bringing the braking strains upon the rear axle and relieving the springs of heavy stresses. These rear springs are semi-elliptic, are of 50 inches length and three inches width, with capacity of 6000 pounds each. Fitted above and paralleling the rear axle is a jack spring carried on a chair mounted on diagonal frame members reinforced by heavy gusset plates at top and bottom. This is intended to absorb severe road shocks and to protect the rear springs against overloading. Should there be occasion to carry a load that would necessarily be on a small platform area, not distributed over the entire machine, this construction would protect the rear springs. The front springs are semi-elliptic and 42 inches length and three inches width, with capacity of 2000 pounds. All springs are retained by heavy clips which fit grooves in the spring clip separators, thus preventing movement of the springs in their saddles.

The extreme care taken in the suspension construction is demonstrated in the spring link bolts and shackles. With one shackle the hardened steel link pin, which passes through a bronze spring bushing, is welded to the shackle to form a unit and prevent any movement. The other shackle for the same spring is bolted on. All spring link pins have grease ways and are drilled to distribute grease from the cups, which are cut from the solid metal and are integral with the bolts. The spring brackets are steel castings riveted to the chassis frame by .375-inch rivets. The eyes of these brackets, through which the spring shackle bolts pass, are bushed with phosphor bronze.

Chassis Frame Details.

The chassis frame is in keeping in design and construction with the other features of the truck. It is of channel section pressed steel alloy six inches wide and 2.5 inches deep, and .3125 inch thick. The six channel section cross members are heavily reinforced at top and bottom by large steel gusset plates. Few holes are made in the members and these are drilled and reamed instead of punched. All joints are hot riveted, the .375-inch rivets being carefully headed, inspected and tested. The wheels are of cast steel which are stronger, lighter and are not affected by road shocks. The rear wheels of this truck weigh more than 50 pounds less than similar wooden wheels. It was determined by the engineers after exhaustive experiments that much of the resiliency with wooden wheels was due to the movement of the members in the sockets, which was regarded as being a destructive influence. The wheels used are 40 inches in diameter, it being believed these are more economical of tires, afford larger clearance, and give easier traction. The rear tires are dual, each tread six inches, and the forward tires are single tread, six inches wide. This equipment is believed far in excess of any requirements and ought to minimize the tire expense.

Control Members.

The control of the truck is by a wheel mounted on a vertical steering column, the gear being of the screw and nut type, a triple thread screw of large pitch being employed. In the design large bearing surfaces have been provided to insure against wear, and to compensate any wear by adjusting bushings and nuts. The connecting rod and tie rod constituting the linkage between the steering knuckles are 1.37 inches in diameter, steel tubing, with universal joints. These are behind and have the protection of the front axle from road obstructions. The throttle lever is mounted on the steering column and a foot accelerator is available for use in heavy traffic, so that the driver may have both hands free. There is no hand ignition lever, the Bosch magneto firing the motor 19 degrees before top centre, and when starting the battery circuit fires one degree after top centre. There are separate pedals for the clutch and foot brake, and side hand levers actuate the emergency brake and effect the changes of speed.

The motor assembly is covered by a superstructure that also carries the driver's seat and which may be quickly removed should it be necessary to grind the valves, for instance, without removing any of the control apparatus. The driver's seat is hinged to be turned or folded backward on the truck deck, and the aluminum floor boards and the sides of the superstructure may be removed to inspect the motor. The gasoline tank, of 25 gallons capacity, is beneath the driver's seat and is connected with the carburetor by a flexible metallic tube.

The Locomobile truck equipment includes standard accessories and tools, such as Prest-O-Lite tank, odometer, lamps, jack, repair kit, etc.

NEW REMY LOW SPEED MAGNETO.

A new type of magneto, specially designed for trucks or tractors employing low speed heavy duty motors, is announced by the Remy Electric Company, Anderson, Ind., maker of ignition specialties. The new product is listed as type R F and has three sets of permanent magnets, large laminated inductors, ample stationary winding and a heavy oak coil.

Before placing the device upon the market it was subjected to most extensive tests for electrical and mechanical efficiency and it survived these successfuly. In addition it was subjected to endurance tests in the Remy plant and at laboratories of various motor car manufacturers. It was particularly subjected to throttling down trials.

The new magneto offers all of the details of construction found in the new Remy multi-cylinder high speed magnetos, and is designed to withstand severe service. All wearing parts are of the best chrome vanadium nickel steel, carefully and scientifically measured and tested for hardness and wearing qualities by instruments such as the scleroscope and other devices.

The magnets are of the finest tungsten steel, heat treated and hardened by a special process in the Remy plant. The inductor shaft is of high grade steel and ground accurately to size. The cams are of chrome vanadium nickel steel, ground to size, inside and out, fitting the magneto shaft perfectly. They are hardened in a special furnace equipped with a pyrometer insuring accuracy in temperatures.

The cam house of the new magneto is smaller and more refined than heretofore and incorporates effective improvements, retaining at the same time all of the Remy standard features of outside adjustability and simplicity. The contact screw is held by a lock spring and to make an adjustment the former is pulled up and the screw turned a few notches. This makes it possible to set the device accurately without tools of any kind. Inside of the cam house is an oiling wick which sets against the cam, ensuring proper lubrication at all times. The cam house, which is removable, is held in position by a stiff spring mounted on a stud which projects from the base of the magneto. The distributing parts are constructed of a new material known as bakelite. Special magneto cone type ball bearings are employed to eliminate noise.

SAMPSON DEVICE FOR WINTER DRIVING.

Recognizing that winter gives delivery systems their severest tests, three important features have been incorporated in Sampson trucks, made by the Alden Sampson Manufacturing Company, Detroit, a constituent of the United States Motor Company, New York City. These consist of detachable hubs, by means of which a change to winter equipment may be made quickly; a differential locking device for securing traction with both rear wheels, and an enclosed chain drive.

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ANTI-FRICTION BEARINGS FOR WORM GEARING.

Victor W. Page, M. E., Again Makes Reply to Criticisms Offered Concerning His Original Discussion of This Interesting Subject.

CONSIDERING the subject of anti-friction bearings for worm gear mounting in the December issue of MOTOR TRUCK, Victor W. Page of the New Departure Manufacturing Company, Bristol, Conn., arrived at conclusions which were questioned by H. Kerr Thomas of the engineering force of the Pierce-Arrow Motor Car Company, Buffalo, N. Y. The discussion was continued in the January and February numbers, in the latter of which John Younger, also of the Pierce-Arrow engineering force, united with Mr. Thomas in questioning Mr. Page's position. Again Mr. Page makes reply and MOTOR TRUCK believes the discussion is of sufficient interest to its readers to reproduce the entire letter with accompanying drawings.

Editor, MOTOR TRUCK, Pawtucket, R. I.

Sir:

I am in due receipt of your favor of the 31st ultimo and again desire to express my thanks for your courtesy in permitting me to answer the letters of criticism, copies of which you enclose. I have read these over carefully, and while I can now see that I made an error of some magnitude, still I am not convinced that my critics are entirely correct in all their statements and I am sure that some of my remarks have been misunderstood.

As the article in question dealt with a main idea of adaptability of double purpose bearings to resist both thrusts and radial loads and not with points involving worm gearing design, I feel that the criticisms of both Messrs. Thomas and Younger regarding my practical experience with worm gearing were uncalled for. In my original article direct reference was made to the loss of efficiency when plain collar bearings were used to resist thrusts, in order to make the advantages of anti-friction forms clearer. Arguments advanced regarding difficulty in securing adequate lubrication and coefficients of friction applied specifically to plain collar forms of thrust bearings and not to worm gears. As Mr. Thomas agrees with me that these are not suitable, and that he would never advocate their use, I can see no reason why further discussion of this point should be made. It is admitted that one of the objections to their use is difficulty in oiling and power loss if subjected to more than moderate pressure.

In answering the criticisms anent my reply to Mr. Thomas it is necessary to remind your correspondents of one important fact, and that is, that I did not attempt to pose as an authority on worm gear design, and distinctly stated so, and did not attempt to attack worm gearing, as Mr. Younger and his confrere evidently believe if this can be judged by their justifiable defense of worm gearing. Surely the paragraph which follows, taken from the original discussion, would tend to dispel any thought that I wished to pose as an authority "It is not the purpose of the writer to consider design or analyze closely the methods of obtaining accurate tooth form, but rather to discuss the problem of mounting, which is recognized as one of the important conditions making for successful installation." This could never be misconstrued and make a discussion which pertained only to the adaptability of the double purpose bearing for resisting both thrust and radial loads an exposition on the merits, lubrication or design of worm driving gearing

If in his reply to Mr. Thomas' first letter, the writer brought forth facts to prove that plain collar type bearings were not suitable to take worm thrusts, it was because it was this point that was considered in the original discussion, and not difficulty in worm gear lubrication. No point was made that worm gears could not be lubricated satisfactorily. Surely the results obtained in actual practise would prevent any one even remotely familiar with automobile construction (and even without the advantages of the correspondence course so earnestly recommended by Mr. Younger), from making a statement so widely opposed to actual facts. The point was made, however, that there would be difficulty in securing adequate worm lubrication if the thrust were 30,000 pounds while the gearing was in operation, the truth of which will not be questioned. As Mr. Thomas has made plain that this pressure only exists at a time that one would not need any lubricant between the teeth because the gears were not turning, it would seem that the fact that no oil would be present between the teeth did not matter much, one way or the other. Let it be remembered, however, that Mr. Thomas' estimate of the maximum load existing, or 30,000 pounds, was figured when the gearing was at rest and was compared to the loads given by the writer when the gearing was in motion. This fact alone would account for considerable discrepancy between figures, even assuming that both of us were correct in our original statements. As Mr. Thomas did not fully qualify this rating, or state clearly the conditions obtaining at the same time the load existed, the writer assumed that comparison was made under the same conditions that existed when he made his deductions; that is, with the gearing in operation.

There was an error of some magnitude in following out the formulae in the writer's original article, and both Mr. Younger and Mr. Thomas are right in stating that my first estimate of tooth pressures was too low. I have carefully gone over my original figures and corrected the error. No excuse except gross carelessness on my part in going over the matter too hastily can be given for the original error. Needless to say, had the problem been one of actually selecting bearings for a typical installation and making recommendations, it would have been settled in a much different manner. A graphical layout would have been made and checked over by competent engineers before any sizes were recommended. If Mr. Thomas will overlook my first pique, at what on more mature reflection I see was well meant criticism on his part, and attribute it to zeal in defending the usefulness of a bearing that has so thoroughly proven its worth, rather than ignorance (as Mr. Younger perhaps a little too hastily assumed) I wish to express my thanks for his calling my attention to errors of some magnitude.

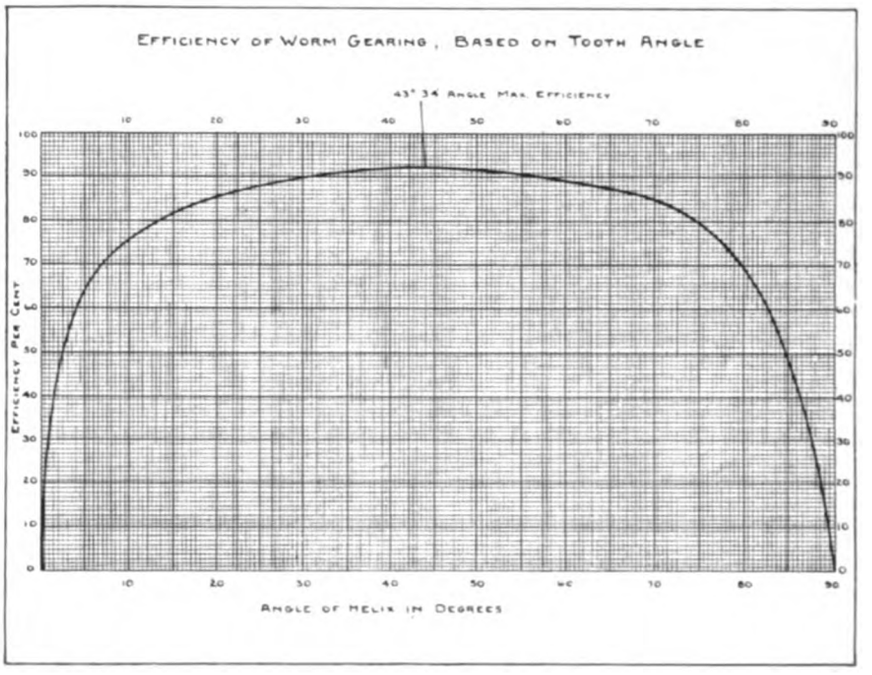


Chart Showing Efficiency of Worm Gearing, Gives a Value of 88 + Per Cent. for Tooth Angle of 26 Degrees 45 Minutes.

I wish to assure both of these gentlemen that I do not question their experience with worm gearing, and I questioned their loads merely because my experience with anti-friction bearings showed it would be difficult to use these if the loads were exceptionally high and the speed of rotation did not diminish in proper ratio to alter conditions.

Consider the conditions stated by Mr. Thomas where 30,000 pounds is given as the pressure between gear teeth caused by "sudden application of engine power," which would immediately cause the engine to stop because the resistance is so much greater than the force applied to the worm gear, or condition, "B Locking of brakes if fitted to transmission shaft." In either of these cases, the worm rotation is very slow. In one, that of braking, it may be stopped altogether. If this pressure obtains between the teeth under these conditions, the effect on the thrust bearing is materially different because it also is turning very slowly. This is recognized by Mr. Thomas in his letter of Jan 19 wherein he says, "But fortunately this force does not exist (except)

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when running at very low speed." The slower a ball bearing of given size turns, the greater its load carrying capacity. For instance, a bearing of the cup and cone type having 35-degree load line which will carry but 55 pounds thrust at 2000 revolutions a minute will sustain 180 pounds at 200 revolutions. The capacity of a bearing of the cup and cone type under thrust load is not as high as that of the usual ball thrust washer type. With the line of contact practically at a horizontal plane or parallel to the shaft, the resistance of the stationary thrust bearing will be proportionate to the elastic limit of the balls times the number of balls used in the bearing. With a cup and cone type having an angular contact, the thrust resisting power will be less with increasing angularity of load line from the horizontal. If the bearing be rotated, the load capacity decreases when the number of revolutions increase.

Assume that a pressure of 30,000 pounds exists between the teeth when the wheels skid from a well applied braking effort. At this time the wheels are stationary or they would not skid and the worm gear and worm are also at rest. If the wheels are moving slowly, the worm shaft is moving correspondingly slow. Therefore, when the conditions are such that the worm teeth are subject to a thrust of 30,000 pounds, they are also favorable to the bearing, whose capacity for resistance is augmented many times because of the exceedingly slow speed of worm rotation.

Mr. Thomas has considered the loaded rear end weight of the truck to be 16,000 pounds. Perhaps this is right for the truck Mr. Thomas is interested in, but reasoning from current practise, it does not seem reasonable to impose such a proportion of the load on the rear wheels, as this appears to be.

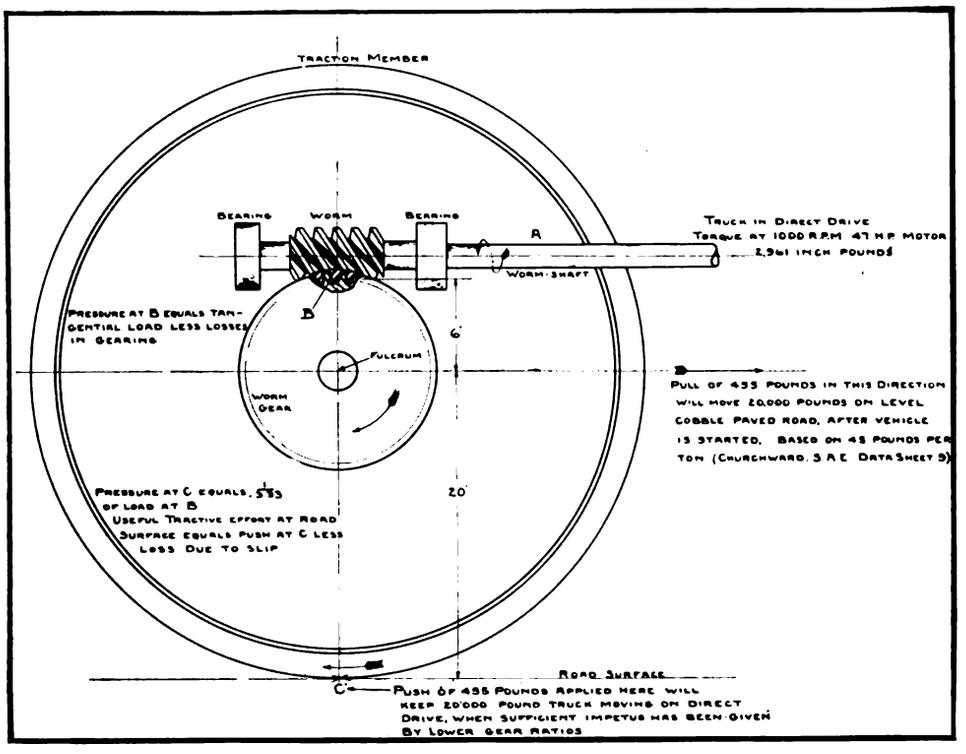


Fig. 1—Outlining Conditions Assumed in Determining Thrust Loads on Worm Teeth When Truck Is on Direct Drive.

The weight for a five-ton truck chassis and body, obtained by taking an average of the published weights of eight American trucks of that capacity show that the usual weight is about 8000 pounds. Say that it will weigh as much as its load capacity, or 10,000 pounds. If this be the case, the 16,000 pounds cited by Mr. Thomas is four-fifths, or 80 per cent. of the vehicle load placed on the rear axle. Engineers usually try to distribute the load more evenly. In fact, 70 per cent. of the net load over the rear axle is usually considered a fair proposition. The writer does not question Mr. Thomas' figures as relates to the weight of his truck, but if correct, it must weigh more than other trucks of its capacity. My recollections of the chassis as displayed at the show is one of unusually substantial proportions, which is a fault only when carried to excess. If the truck weight is not high, then the proportion of load carried by the rear end is high if compared to current practise.

In contending that the loads would be as given, the writer figured from the power plant and back through the gearset, and the tooth pressure existing at the various speeds was taken in order to find the greatest pressure which would be present while the gearing was in motion rather than at rest. Cognizance was taken of the power loss due to gears and bearings of gearset, because the net power applied at the worm and not the primary engine power must be considered in basing the size of the bearings to be used to resist both thrust and radial loads obtaining incidental to worm operation. Then, too, while the writer based his figures on the torque of the motor, both Mr. Thomas and Mr. Younger have worked from the other end of the vehicle. The writer is still under the impression that the figures stated by Mr. Younger are too high. Surely, they do not check up with the tooth loads imposed by the torque of the motor which must be considered a factor of some moment, inasmuch as it is the pressure resulting from it between worm and gear teeth that produces motion of the vehicle.

In selecting ball bearings to resist the loads given, we will not attempt to consider the tooth load when reverse gears are engaged; in fact, common practise in selecting bearings according to catalogue ratings is to take the load existing on intermediate speed as that for which the bearing should be selected. In his letter, Mr. Younger says that the thrust on second speed is 6400 pounds and intimates that it will be necessary to use a double purpose bearing 12 or 15 inches in diameter to take it. We will not consider this too seriously until we see what size ball thrust bearing of the conventional type will be needed to sustain this thrust at a worm rotation of 500 revolutions a minute. Surely, this thrust must be resisted by some means, and we all seem agreed that ball bearings are suitable for that purpose, if selected with reference to the loads which obtain. Refer to bulletin No. 25 issued by Standard Roller Bearing Company, Philadelphia, Penn. This gives capacities of various bearings of the regular ball thrust washer types. No bearing is listed to take this load at 500 revolutions a minute, but at 200 revolutions a minute we find that either bearings No. 1407, 2407 or 3407 can be used to support loads of 6480 pounds, which is about the load said to be present by Mr. Younger. In this connection we must note also that the speed of rotation is much lower; in fact, less than half that of the worm when it is on intermediate or second speed. This bearing has a bore of 2.5 inches, an overall diameter of 6.875 inches and uses nine 1.375-inch balls. Now, this is a fair sized bearing, and yet according to the tables prepared presumably for the guidance of engineers, this bearing will not support this load safely at speeds in excess of 200 revolutions a minute. At speeds of 500 revolutions we find that bearings 1309, 2309 and 3309 will sustain a load of 3510 pounds, or a little more than half the load determined to exist by Mr. Younger. This is also a respectable size bearing, as the bore is 3.5 inches, the diameter 7.125 inches and 11 1.25-inch balls are used.

Seeking still further we fail to find a bearing listed capable of taking the load said to exist by Mr. Younger at the speed or rotation at which the thrust exists. At the other hand, take the condition stated by Mr. Thomas, or 30,000 pounds on the teeth of a stationary worm. Here the same condition obtains as in a crane hook thrust bearing, where movement is very slow; in fact, it is merely an oscillating movement rather than a continuous rotary one. A S. R. B. bearing No. 1407 will resist a thrust of 33,000 pounds safely under the conditions stated. While this is not an exceptionally large bearing, it is a fair sized one as has been shown previously and could be used reasonably if its thrust-resisting capacity was adequate to sustain the load said to be present by Mr. Younger at 500 revolutions a minute, but it is not. Here, then, we have the peculiar condition of a bearing capable of taking the maximum thrust under one condition, being entirely unsuited to resist a stress of about one-fifth its value under other conditions of speed.

It was this fact that led the writer to question the load ratings given by Mr. Younger. Surely, these are too high or else bearings used when these pressure obtain are very much overloaded unless they are of very large size. By the use of large balls, very severe loads can be resisted, but when these are employed, it makes an increased bore and diameter necessary to take the same number, and if the bearing size is kept down, the number of balls and carrying capacity are reduced proportionately. There is a fixed relation between the two which makes it imperative to use larger bearings as the loads augment, a self evident truth that seemingly is not considered fully by Mr. Younger when stating the loads existing at the worm teeth. The effect of speed of rotation must be considered in figuring bearing capacity. It would be very difficult to select a bearing that would not be impractically large if the thrust loads were as high as stated. I agree with Mr. Younger that it would take a bearing at least 12 inches in diameter to resist a load of 6400 pounds at 500 revolutions a minute. A conventional ball thrust washer of that diameter would be needed if one were to judge from the capacities listed in bulletins considered. This will only resist loads in one

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direction, which means that two of these, as well as two radial bearings, would be needed to support the worm shaft.

To show that double purpose bearings can be used for worm gear mounting, let us consider the load imposed by the engine, compare it to the tractive effort needed to maintain motion of the vehicle and arrive at the load existing between the teeth of worm gearing by considering the power applied, rather than the resistance or push at the contact point of road and wheel, said to exist by Mr. Younger. Obviously, this must be less than the useful energy given to the gearing or the vehicle will not move. An engine of given power can give no more than a certain torque, this in turn can only produce a definite pressure between gear teeth. This pressure must be greater than resistance to vehicle movement if the engine have sufficient power to propel the vehicle. Neither Mr. Younger nor Mr. Thomas questions the fact that 40 horsepower should be adequate to drive a five-ton truck under reasonable conditions. The writer will endeavor to show the line of reasoning he believes correct when determining bearing sizes to resist loads caused by pressures existing between gear teeth which must be taken when this gearing is in motion, and not at rest.

Let us endeavor to arrive at the reason for the variation between the loads given by the writer in this letter and those stated by Mr. Younger in his. Evidently, Mr. Younger has assumed that practically the same power is utilized at all vehicle speeds, which is not true. The road resistance is much less when the second speed gearing can be used than when the low gears must be employed. The gearing is used so the engine can be run up to speed and maximum power obtained at those times that the resistance is too high to permit of the truck moving ahead on the direct drive. Obviously, it is not just to base the tooth pressures on the amount of horsepower of the motor, by multiplying this by the speed of the vehicle and disregard the other conditions. I recognize that my faulty reasoning in original articles made the loads too low, which I would have discovered soon had I checked up the matter carefully. In his haste to defend worm gearing, could not Mr. Younger make an error and figure his loads too high?

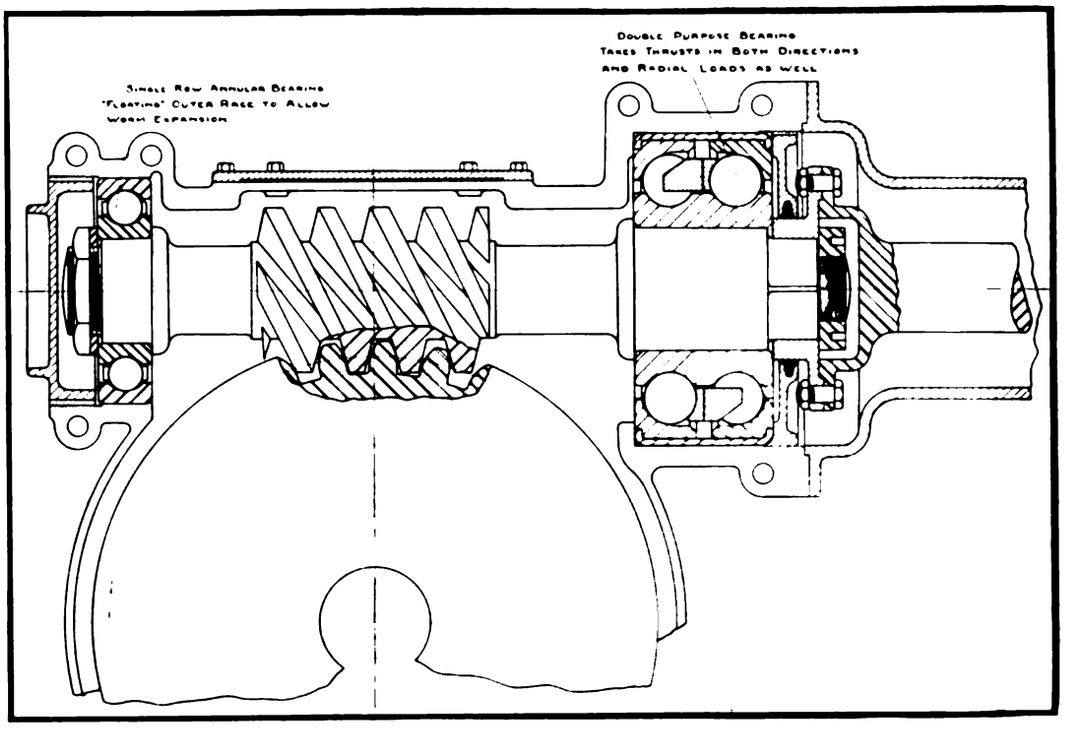


Fig. 2—Suggestion for Mounting Double Purpose Bearing to Resist Thrust in Two Directions and Carry Radial Load as Well—Note Simplicity of Housing and Unit Construction of Thrust Member.

In my first article I considered the matter solely from the point of view of the bearing enthusiast and when the loads worked out so favorably to ball bearings, I did not give the matter the thought it deserved. Mr. Younger considers the matter of load solely from the point of view of one interested in worm gears. In one case I was satisfied to find the tooth pressures and resulting thrust and radial loads low, because I thought only of bearings. At the other hand, Mr. Younger tries to make the tooth pressures as high as possible with a given horsepower to show the value of worm gearing. This leads both of us to make statements that are open to question and an unprejudiced engineer who followed the controversy might be forgiven for suggesting that a review of the elements of mechanics would benefit us both. In making an effort to end the controversy with this reply I will try to go more fully into the solution of the problem than either I or my critics have previously.

In his figures, Mr. Younger takes the horsepower delivered the worm when the change speed gearing is in operation at too high a value, because he quotes an ideal efficiency. While the motor delivers 47 horsepower at 1000 revolutions a minute, considerably less than this will be imparted to the worm gear teeth by the worm. Two main sets of losses must be taken fully into account. First, those existing in gearset when change speed gearing is in operation. Second, that existing at the driving gears at all times they are in motion. On the direct drive, one need only consider the latter, while the former must be considered first, then the other loss deducted when on the other speed ratios.

The writer agrees with his critics that his first figures were wrong, but cannot see how transmission losses can be disregarded. When on the low and intermediate speeds there are two pairs of gears and bearings working, besides the driving gearing. Considering a loss of 12 per cent. for the change speed gears the 47 horsepower delivered to the front end of the gearset becomes but 41.3 horsepower on the drive shaft, which in turn becomes 15 per cent. less (assuming a worm gear efficiency based on teeth 26 degrees 45 minutes angle), or about 35 horsepower at the worm gear teeth. Therefore, in figuring pressure existing between worm and worm gear teeth the materially reduced power effort, which is directly affected by the entering torque, must be taken into account.

The loss due to driving through ordinary worm gearing is greater than five per cent. It will more often reach a value of 15 per cent. loss as shown both by chart presented herewith and by formulae given in original article. On the reverse drive we would not be delivering 35 horsepower to our worm gear but the energy applied would be about 34 horsepower because of the 15 per cent. loss in the gearset with reverse gears in mesh. The actual pressure existing at worm gear pitch circle must be computed on this basis because of driving gearing losses. This might be reduced further by driving shaft angle and universal joint loss. We will disregard this, however, in the case in point, and assume that the truck has a straight line drive with no possibilities for power loss except through the gearing and it must be apparent that the gearing considered would have a materially lower efficiency than the form which Mr. Younger has in mind.

In basing his estimates of power or push exerted at rear wheels he has considered that his worm gearing is working under such conditions that it has an efficiency of 95 per cent. He also disregards my stated efficiency of 85 per cent. and substitutes in its stead his own value. I based the value I gave on the chart presented herewith, the exact derivation of which I am not familiar with, but which I used because it appeared reasonable and checked up the formulae. I would like to call Mr. Younger's attention to the fact that in the case stated the angle of thread was 26 degrees 45 minutes. Using the chart I found that the efficiency given for this thread angle was about 88 per cent., checking my previous calculation. Taking into account that this related to perfectly machined and fitted worm gearing; in fact, a tool room job rather than a regular commercial proposition, I deducted another three per cent. to take into consideration any defects which would make the actual efficiency less than that given in the chart. In view of this explanation, I feel that I was taking a safe value for the efficiency and ask why Mr. Younger should object to my retaining it in my calculations involving this specific case and not the nearly perfect worm gearing he has designed; and probably has in mind when he gives the higher efficiency? In fact, the chart shows that with a tooth angle of 43 degrees 34 minutes we reach the maximum value, which is given at but 92 per cent., this being less than that used by Mr. Younger.

Considering tractive effort needed for commercial vehicles with solid tires as given by Churchward on S. A. E. data sheet No. 9, we find a value ranging from 18 to 26 pounds a ton given for level asphalt. Multiplying the maximum value of 26 pounds by 1.75 which is the ratio the tractive effort required on cobble stone paving bears to that needed on level asphalt, we arrive at the conclusion that a drawbar pull of 45.5 pounds will keep a ton load moving if this be supported

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by rotating members. This is a high value and it will probably take less than this. This would mean that a pull or push of 455 pounds would move 10 tons, or the loaded weight of the average five-ton truck after it had once been started. Operated under these conditions, the direct drive could be used. The point to determine now is the pressure applied to the worm gear teeth by the engine and see if it will supply the necessary tractive effort to the tires of the driving wheels. Take the engine rating first considered by the writer, that of 47 horsepower at the speed of 1000 revolutions a minute. Turning moment or torque delivered the worm shaft may be determined by the following simple formula (taking the constant 63 as a value based on 1000 rpm):

$$Pp = 63 \times H.P.$$

Substituting known values we have a torque at the centre of the worm shaft of 2961 inch-pounds. Dividing this by the radius of the worm or 1.5 inches we get a load at the worm teeth of 1974 pounds. This, minus loss, is applied to the short arm of a simple lever of the first class (with the fulcrum between the load and power) that has a ratio of 3.33 to one. The pressure applied at the short end will be reduced to less than a third at the long end. Taking a gear efficiency of 85 per cent. we will have an actual pressure of 1698 pounds at the short arm of the lever. Dividing this by the ratio of leverage or 3.33 to one we find that the actual push at the wheel peripheries will be about 510 pounds.

In this connection the writer would say that if he were considering a truck design, he would provide a lower ratio of drive than eight to one, especially if 40-inch wheels were used, because the vehicle speed under these conditions would

Using the same formulae given in the original article, but supplying correct values in this instance, I arrive at very much the same conclusion reached by figuring tooth loads from entering torque of motor at the worm. This line of reasoning follows, the condition assumed being 40 horsepower delivered to worm gear which is turning at 125 revolutions a minute with truck on direct drive:

First find turning moment on worm gear shaft by the following formula:

$$P = \frac{63{,}025 \times H.P.}{N} = \frac{63{,}025 \times 40}{125} = 20{,}168 \text{ inch-pounds.}$$

To find moment on worm shaft we can use the following formula:

$$Tw = \frac{T \times I}{E \times N}$$

Where—

T = Twisting moment at worm gear shaft.
I = Index of threads, 1 for single, 2 for double, etc.,
E = Efficiency for gearing,
N = Number of teeth in worm gear,

Substituting known values we have:

$$\frac{20{,}168 \times 4}{.85 \times 32} = 2965 \text{ inch-pounds.}$$

To find pressure at pitch line of worm we use the expression:

$$P = \frac{Tw}{R} \text{ or } P = \frac{2965}{1.5} = 1976.6 \text{ pounds.}$$

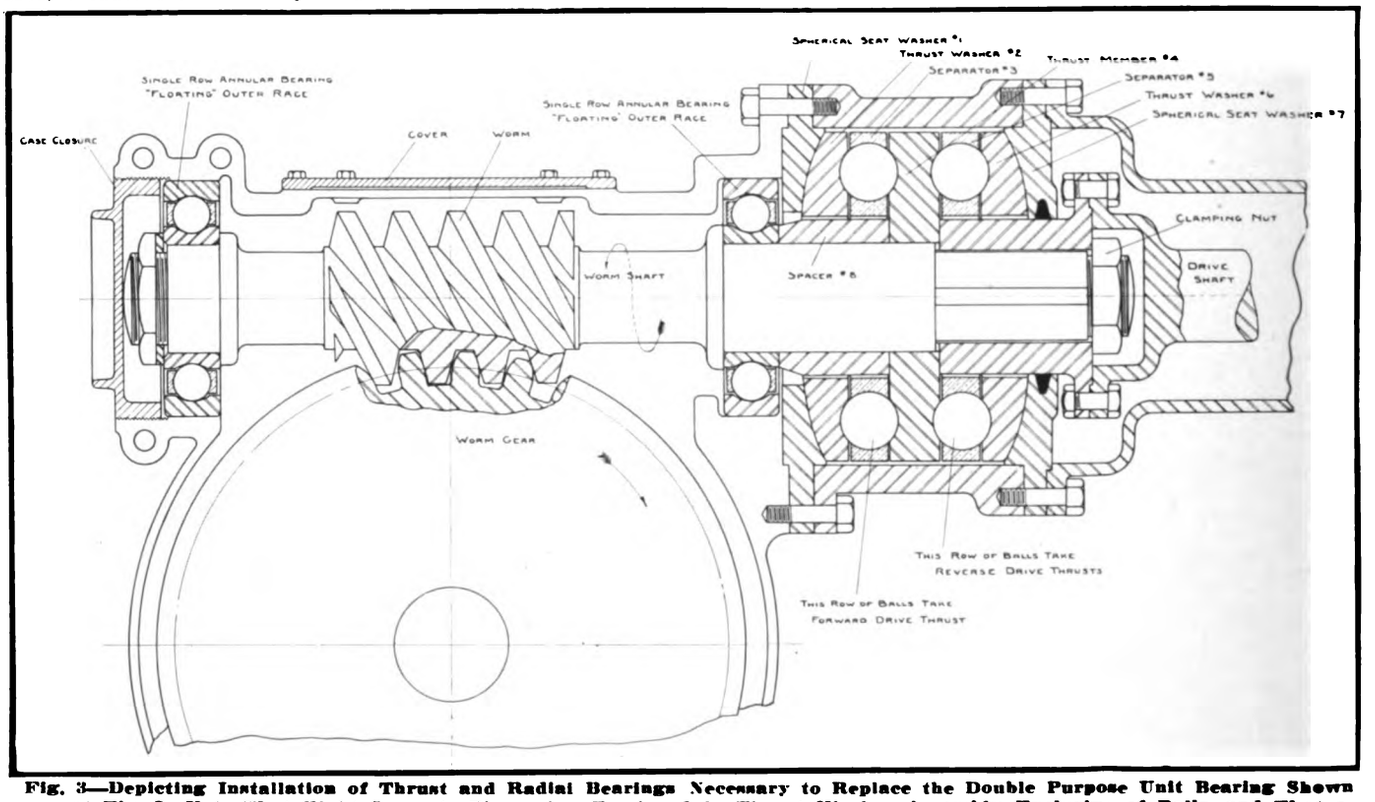


Fig. 3—Depicting Installation of Thrust and Radial Bearings Necessary to Replace the Double Purpose Unit Bearing Shown at Fig. 2—Note That Eight Separate Pieces Are Employed in Thrust Washer Assembly Exclusive of Balls, and That a Single Row Annular Bearing Must Be Used to Resist Radial Loads.

be too high for a truck of five tons capacity. As no attempt was made in the original article to consider anything but bearing mounting suggestions, it is not necessary to analyze too deeply a set of conditions relating to truck design or worm gear construction only assumed to make the main idea, that of bearing installation, clearer. For convenience in calculation, I have assumed a condition which does not exist in practise; that is the application of all the power at the rim of one driving wheel. This does not alter the reaction load on worm tooth because if two driving wheels were used, not only the weight to be moved and considered as resting on the rear wheels, but the useful driving effort, will have to be divided by two.

Take the other extreme case, where the tooth pressure would be greatest or when the reversing gear was engaged, we can arrive at the pressure at the worm pitch line by using the formula which follows:

$$P = \frac{63{,}025 \times H.P.}{R \times N}$$

Where—

R = Radius of worm,
N = Number of revolutions a minute.

Substituting known values we have:

$$P = \frac{60{,}025 \times 40}{1.5 \times 250} = 6722 \text{ pounds.}$$

The figures obtained by either method are very nearly the same, and if a pressure of less than 2000 pounds at the worm pitch line will drive the truck on the direct drive, and if this is a maximum that we can obtain from our 47 horsepower engine after losses are considered, it is difficult to see how a lever which decreases the load instead of multiplying it can exert more than a third of this amount at the point of contact of the wheel with the ground, under the conditions stated and shown at Fig. 1, herewith.

The load on the worm gear teeth cannot be taken as the amount of end thrust on the bearing, however, as it will be resolved into radial and thrust load components, the relative value of which will vary with the thread angle and the extent of which can only be determined properly by considering a carefully made graphical layout of the gearing in question. As a general statement, one may say that the thrust will vary from 90 to 75 per cent. of the tangential load, this depending upon worm tooth angle, and this is a high value.

Considering the thrust load to be resisted by the bearings, we will see if this is so high that it cannot be taken by a double purpose bearing of proper size. Take the thrust existing on second speed as a basis for selecting a bearing according to catalogue rating, the overload capacity of such a bearing being sufficient to cope with the greater but seldom occurring loads on the low and reverse ratios. Here we must consider

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a 12 per cent. loss in the change speed gears before figuring the power applied to the worm. Instead of 47 horsepower which is applied to the front end of the gearset, we have 41.36 horsepower, delivered to the worm shaft at 500 revolutions a minute. To find torque at centre of shaft we use the formula:

$$P = \frac{63{,}025 \times \text{H. P.}}{N} = \frac{63{,}025 \times 41.36}{500} = 5213.4 \text{ inch-pounds.}$$

Dividing this by the radius of the worm we get a tooth pressure of 3475 pounds. Not all of this load is a thrust to be taken by the bearing, however. Taking the highest value, we can assume that the end thrust on second speed ratio is about 3000 pounds. The bearing to be used, if this be true, is one that will sustain 3000 pounds at 500 revolutions a minute.

If the conditions be as stated by Mr. Younger and a load of 6400 pounds is present when the vehicle is in intermediate gear, and considering that this is the amount of pressure that resists worm rotating, we must impart a little more than this to the gear by the engine in order to produce vehicle movement. This would mean that an entering torque nearly twice as great as that obtainable from the engine considered in this specific case would be needed, or that the engine power would need to be doubled to impart sufficient energy to the worm to drive the loaded truck, if this were the correct amount of pressure existing between the teeth.

The reason for the writer's previous remarks in replying to Mr. Thomas is just as Mr. Younger has surmised, and were due more to enthusiastic defense of the excellent features of the double purpose bearing than to proper reflection of the facts of the case in point. Mr. Thomas' statement that bearings should not be selected with reference to loads said to be present by the writer in the first article or they would fail in service, was correct, and I see no reason for questioning his estimate of maximum load on the stationary worm teeth, now that he has fully stated the conditions which are present at the time this load obtains.

Mr. Younger, at the other hand, goes on record in saying that it would not be possible to provide a double purpose bearing less than 12 or 15 inches in diameter to resist worm thrusts due to 38 horsepower torque and to support his contention he cites pressures twice as great as those the writer now believes to exist after revising the faulty figuring which led him astray in the first instance. If the writer's low estimate were an injustice to the power transmission qualities of worm gearing, surely Mr. Younger's statement based on "definite, cold blooded logic" which his years of experience have proven to be right, might be misconstrued by other readers, and double purpose ball bearings thought unsuitable for supporting worm gears, notwithstanding the fact that they have been used for this purpose with success.

If we consider, as is general practise, that the bearing should be selected with reference to thrust to be resisted on the intermediate gearing, we find that a double purpose bearing No. 415 having a 45-degree load line will sustain a thrust of 3000 pounds at 500 revolutions a minute. This bearing is considerably less than 15 inches in diameter; in fact, the outside diameter is 7.4803 inches. The bore is 2.9527 inches and it is but 3.25 inches in width. Ten 1.25-inch balls are used a row. This bearing, as shown in accompanying drawing, Fig. 2 (in which all parts are to scale), will replace the two thrust washers and the radial bearing depicted at Fig. 3.

To make the advantages more apparent, let us see what size ball thrusts of the conventional type would be needed. We find that a No. 2309 listed in Bulletin No. 25 of S. R. B. Company will take a load of 3510 pounds at 500 revolutions a minute. This has a bore of 3.5 inches and is 7.125 inches in diameter, 10 1.25-inch balls are used. Even if the construction of this type bearing permitted it to take axial loads in either direction, it would be necessary to use in connection with it a radial bearing to resist the radial component of the tangential load. However, it takes two of these in addition to the radial bearing to replace the double purpose member which the writer favors, and which will take thrust in either direction and carry radial load as well if properly mounted. The housing required for the double row bearing is just as designed for a plain radial annular bearing, and there is no possibility of disalignment between parts of the bearing. At the other hand, where ball thrust washers are used, they must be mounted in connection with spherical seat members, and if the worm expansion must be compensated for (a condition we are all agreed should be considered in designing) the problem of mounting involves some degree of engineering and construction skill, as evidenced by Fig. 3. In either case the thrust members are housed at the front end of the worm, the rear of the worm shaft being supported by a floating single row annular bearing of adequate capacity, and very easy to select from the manufacturer's lists without using excessively large members.

Mr. Thomas cites the maximum thrust pressure as unfavorable to a double purpose bearing. Under the conditions he states, where this load can exist only when the worm is stationary because of a braking effect, a single ball of the bearing recommended in this letter would sustain all of this thrust without being stressed to its elastic limit. I have determined the resistance to crushing of a 1.25-inch ball to be over 100,000 pounds in our laboratory, and surely 10 of these members, which do not vary more than .0001 inch from standard size will not be stressed alarmingly when at rest, by this load, even considering that the load line is angular rather than horizontal.

Judging from both the letters sent you, all my remarks pertaining to lubrication which applied specifically to plain collar types of thrust bearing, have been misconstrued to be detrimental to proper worm gear lubrication, which was not my intention. I do not need to look into a worm gear housing to see that proper lubrication is possible. My only contention was that if the pressure of 30,000 pounds were present while the worm was turning, it would be very difficult to force lubrication between surfaces held together by this force.

As other remarks in Messrs. Thomas' and Younger's letters are evidently based on misinterpretation of my meaning, I do not think it necessary to take any more of your valuable space in discussion. After all, the main point at issue was the suitability of the double row bearing of practical size to resist the thrusts of worm gearing, and not lubrication or design of worm gearing. If my reasoning be correct, I feel that I have shown it possible to save by using double purpose or unit bearings in place of combination mountings. As this has proven to be the case at all other bearing points of the automobile where both thrust and radial loads exist, I cannot see any reason why it does not apply to worm gearing as well. If my final analysis of the loads obtaining (which even now are approximations), based on formulae considering entering torque, are incorrect and the high thrust loads stated by Mr. Younger are present while the gearing is in operation, then the case is one extremely unfavorable to any form of anti-friction bearing except those of extremely large size.

I trust that this letter of explanation may make my line of reasoning sufficiently clear so that further controversy will be unnecessary, as the matter now resolves itself merely to one of differences of personal opinion, which are by no means rare when questions involving machine design are considered.

With a final apology to Mr. Thomas for my previous unwarranted attitude, I beg to remain,

Yours very truly,

VICTOR W. PAGE, M. E.

Bristol, Conn., Feb. 6.

WHITE OPENS NEW SERVICE BUILDING.

The new service building of the White Company, Cleveland, O., in New York City on West 57th street, between 11th and 12th avenues is completed and is in operation, and the location is ideal, being in the centre of the commercial district. The structure is one story but has 25,000 square feet of floor space, and a feature is the absence of posts or pillars, the roof being supported by trussed spans. Overhead lighting is employed by means of large skylights. The department for the maintenance and repair of motor cars is very complete, including a modern machine shop, carpenter shop and a large stock room in which is carried a complete line of White parts.

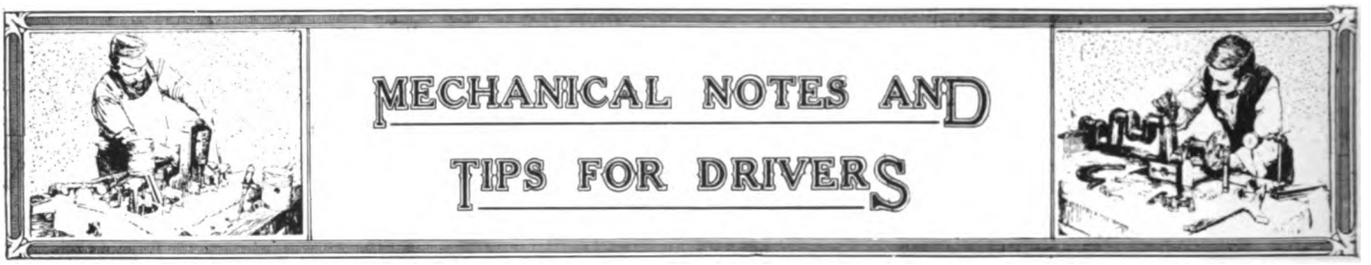
H. R. RADFORD HAS NEW POSITION.

Harry R. Radford, who for several years has held the position of general sales manager for the Cartercar Company, Pontiac, Mich., has assumed the management of all its interests except the manufacturing department. The change follows the resignation of R. A. Palmer as general manager. Although there was considerable speculation as to who would succeed Mr. Palmer, Thomas Neal, president of the General Motors Company, of which the Cartercar Company is a constituent, announced that it had been decided to dispense with the position of general manager. Mr. Radford will have charge of the advertising, selling, credits of agents, etc., and the directing of the seven Cartercar branches in the leading cities.

BOSCH SERVICE STATIONS.

Arrangements for special installation service have been made in all branches of the Bosch Magneto Company, New York City, so that operators of motor vehicles in the vicinity of any branch, desiring to have their present ignition systems changed to that of the Bosch, may leave their cars and have the change effected promptly and at a reasonable figure.

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STEERING WHEEL COVER DEVICE.

Although different forms of gloves are worn, many automobile operators complain of cold hands during the winter. One of the reasons for this is that in gripping the wheel the circulation of blood is more or less impeded by the pressure exerted in holding the member. Some drivers find that the old-fashioned woolen mitten is the warmest covering for the hands, but more or less difficulty is experienced in gripping the wheel because of its smoothness.

Some drivers wrap the wheel with friction tape, and while this material eliminates smoothness and permits the use of mittens, it is extremely cold. At Fig. 1 is presented a method of wrapping the circle with felt which will not only exclude the cold but absorb vibration as well, making long drives much easier of accomplishment. To prevent the cloth from slipping, tape is employed as depicted in the

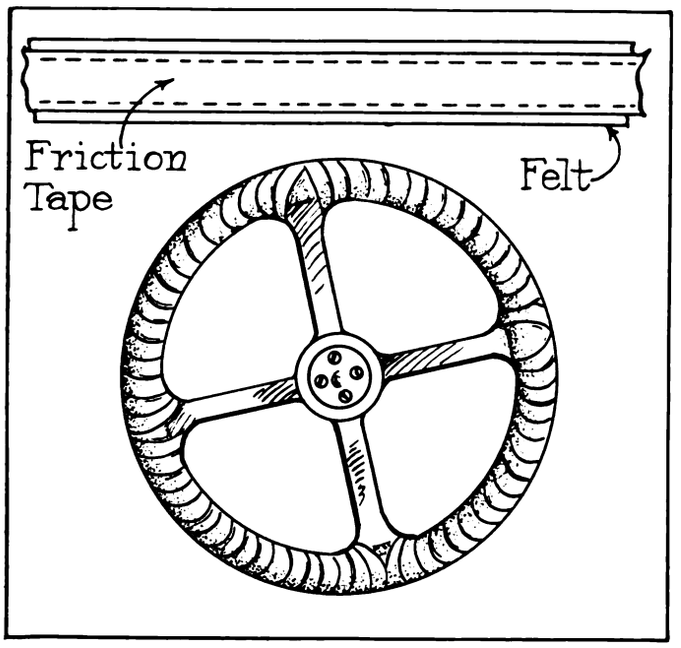


Fig. 1—Depicting How a Wheel May Be Wrapped with Felt Sewed to Friction Tape.

drawing. This cloth is sewed to the felt and should be less in width than the softer material.

The first step is to cut the felt into strips of about .75 inch and sew together as many as will be necessary. The tape is then stitched on and the rim of the wheel covered as outlined. In placing the covering on the wheel the edges of the felt should be wrapped closely together to provide smoothness. When the circle is covered the two ends are sewed together. The tape will grip the wood firmly and being fastened to the cloth will prevent the latter from moving.

SUGGESTIONS FOR VALVE TIMING.

To obtain the greatest efficiency from the internal combustion motor the valve and ignition timing should be correct. In the previous issue of MOTOR TRUCK the latter subject was discussed and the various methods of correcting faulty operation outlined. The average driver hesitates to attempt the correction of the valve setting, and although absolutely accurate adjustment is a delicate task, requiring as it does the expert, considerable improvement may be effected by the novice.

Generally speaking, with the modern motor there is little to cause the valves to become out of time, but wear at a number of points, such as cams, rollers, tappet rods, plungers, etc., will bring about a loss in power. The constant hammering of the tappet against the valve stem sometimes results in these being flattened out, causing the valve to open too late and close too early, or not lift high enough and thus retard the flow of gas to the cylinder. Excessive wear of the teeth on the crank and camshaft, or if either be loose, will affect the operation of the cams and consequently the timing, but with the large gears such as are now utilized in motor car construction, the amount of wear taking place will not make any great difference. And it may be stated also that considerable improvement has been made in the design of valve mechanism, eliminating much of the former troubles.

The correct opening and closing of valves is marked on the flywheel by the majority of manufacturers. These figures and their application puzzle the novice, but are understood easily if the motor's cycle of operation be taken into consideration. The figures, 1, 2, 3, 4, represent the cylinders while the letter I means the intake valve, and E designates the exhaust. Thus, the marking I, O, 2, 3, signifies the opening point of the intake valves of the second and third cylinders. Another set is I, C, 2, 4, which denotes the time the intakes close. When the letter C is employed alone it indicates centre.

The explosions of a four-cylinder, four-cycle motor do not take place in consecutive order; that is, the arrangement of the crankshaft is such that two pistons are up and two down at the same time, as will be noted at Fig. 2. In this instance the first cylinder, usually that nearest to the radiator, is about to be ignited by the spark while the fourth is about to take in a charge of gas. The pistons in the second and third cylinders are nearly at the bottom of the stroke and these are exhausting and compressing, respectively.

The order of firing is 1, 3, 4, 2, and it will be seen that the first to explode is No. 1, the next No. 3 and the last is the second cylinder. This order may be 1, 2, 4, 3, according to the design of the engine. In either case, however, there are four strokes of the piston and two revolutions of the crankshaft to bring about one impulse or firing stroke. By referring to the firing order below the illustration it will be noted that the sequence of the strokes is: Firing, exhaust, compression and suction of cylinders 1, 2, 3 and 4, respectively. By utilizing these tables one may become familiar with the order of explosions and these figures may be employed in timing where the flywheel is not marked.

Where wear has taken place at the tappet or valve stem, and these members are adjustable, the efficiency of

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the motor car can be improved greatly by resetting to conform with the figures on the flywheel, previously mentioned. The usual method is to lengthen the tappet until an ordinary business card may be inserted and while this is commendable a better way is to utilize the figures upon the flywheel.

Many makers fit an indicating arrow or pointer to the motor, this device being installed to facilitate the operation of timing. If the engine be not thus equipped a mark may be made upon the centre of the cylinder or upon the dashboard.

As has been explained, the crankshaft makes a half revolution to each stroke. Referring again to the drawing, it will be seen that the first cylinder is about to fire and that both valves are closed. The exhaust of the second is about to open. If the timing be correct, the indicating arrow will point to the marking E, O, 2, 3. If late, these figures will pass by the indicator and the exhaust tappet of

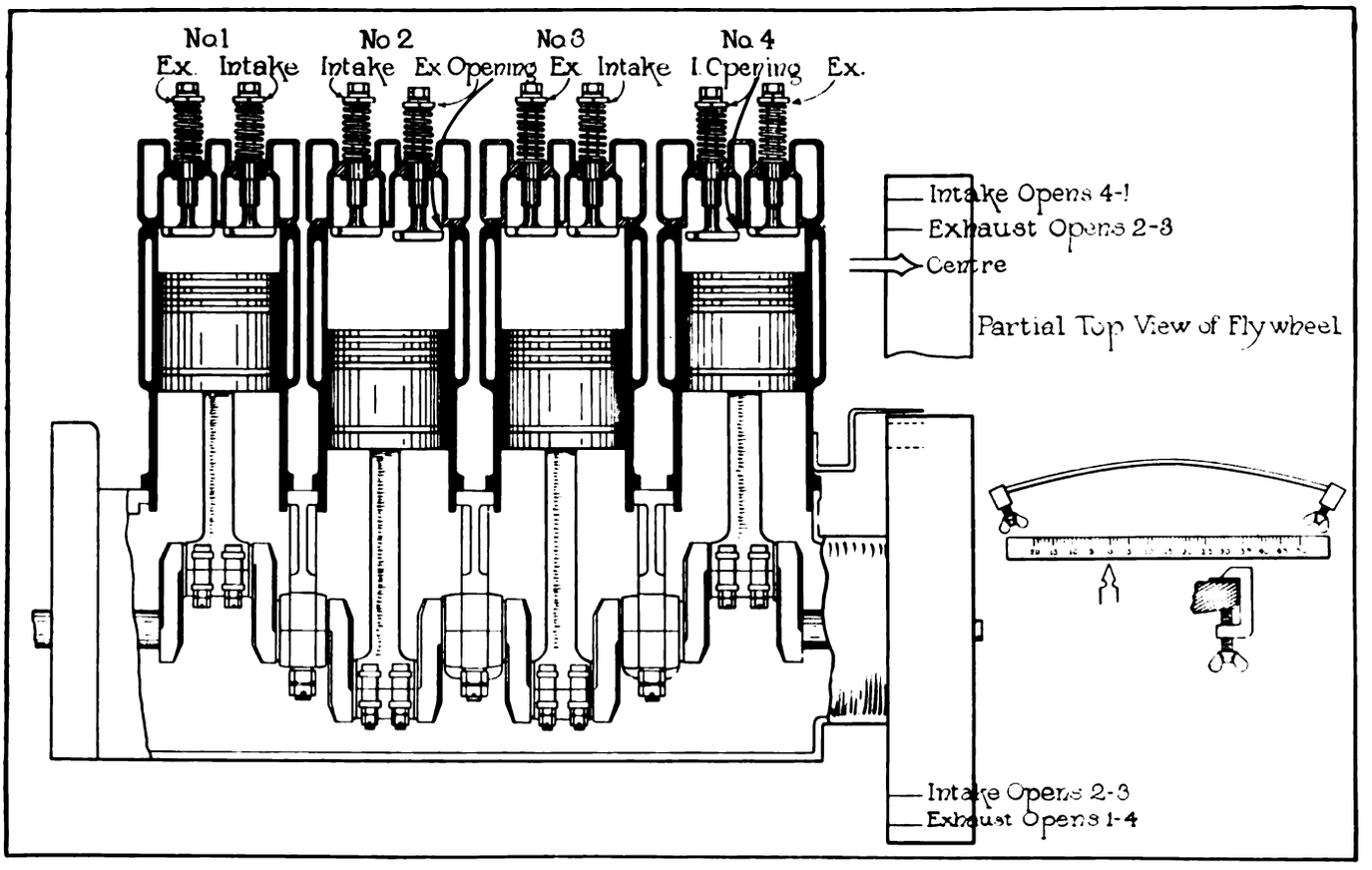


Fig. 2—Illustrating How Valves Are Timed and Tappets Adjusted by Utilizing the Markings on the Flywheel.

	Firing Order, 1—2—4—3.		
Cylinder 1	Cylinder 2	Cylinder 3	Cylinder 4
1—Firing	Compression	Exhaust	Suction
2—Exhaust	Firing	Suction	Compression
3—Suction	Exhaust	Compression	Firing
4—Compression	Suction	Firing	Exhaust

	Firing Order, 1—3—4—2.		
Cylinder 1	Cylinder 2	Cylinder 3	Cylinder 4
1—Firing	Exhaust	Compression	Suction
2—Exhaust	Suction	Firing	Compression
3—Suction	Compression	Exhaust	Firing
4—Compression	Firing	Suction	Exhaust

the second cylinder should be adjusted until the valve starts to open or lift in the line.

Moving the flywheel slightly, the marks I, O, 4, 1, should appear as the intake valve of the fourth cylinder starts to lift, and if it does not, this should be adjusted. The flywheel is now given nearly half a turn when the marking for the exhaust members, 1 and 4, and intake, 2 and 3, will appear and can be regulated.

Some makers include the closings on the flywheel and these also can be checked, but many simply mark the openings as too many figures are apt to confuse the amateur. It is not a good plan to attempt improving the setting of the valves as marked by the manufacturer for the motors are thoroughly tested and valves timed to give the best results intended by the designer.

Where the flywheel is not marked, the timing will have to be secured from the factory, but a gauge that will prove useful in timing valves from the crankshaft is shown in the sketch. The device consists of a piece of brass about .0625 inch thick by one wide. As the diameter of the average flywheel is approximately 15 inches, a foot of metal will be sufficient. The fraction of an inch that equals a degree is figured out and marked on the brass as depicted in the drawing. The degree can be ascertained by calculating on the basis of 360 degrees to a circle.

In using the instrument the top and bottom centres of the flywheel are located. This may be accomplished by inserting a rod through the opening in the compression cock or by removing the lower half of the crankcase, or an inspection plate, to ascertain when a piston is at the bottom or top of its stroke. The rule is then laid upon the flywheel with zero mark under the usual pointer or arrow. The points are then marked off or compared. The device can be fastened to the flywheel by clamps as indicated in the illustration.

All correction of timing should be done when the motor is hot in order to secure the best results. The relief cocks should be opened to reduce compression so that the flywheel may be rotated easily. If the motor be not equipped with these devices the spark plugs may be removed. The adjustment of the valve openings is a simple matter and the operation will be facilitated by studying the accompanying illustration, which was so drawn as to make clear the valve openings and their markings upon the flywheel.

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CONSTRUCTION OF SOLID MOTOR TIRES. *

By Charles B. Whittelsey.

SOLID motor tires can wear away and suffer as much from misuse as the pnuematics, and it has been said that lack of knowledge of them lies largely with the manufacturers by their never educating, to any extent, the users of their product to an appreciation of the tremendous difficulties that have been surmounted in arriving at the present state of efficiency—or of the endless amount of experimental work they have done, and the discouraging setbacks that they have had in their efforts to place at the disposal of the public the solid motor tire of today.

Historical.

It is uncertain when or where solid tires were first used for wheels on vehicles. However, their use was not common until after the year 1881, when the Carmont tire was first employed on hansom cabs on the streets of London. The tire adopted was Carmont's patent of 1881 in 1883—"a rubber tire held in rolled steel channels in a state of compression between converging flanges."

The Carmont was the first solid tire introduced in America, by the late Channing M. Britton of the important New York carriage firm, Brewster & Co., for which Mr. Britton obtained the American right under the Carmont patent. Several manufacturers made tires for them.

The next practical advancement in the development of the solid tire made in America was under the patent granted to A. W. Grant in 1896, later known as the Kelly-Springfield. This tire being seated in a rim channel with diverging sides there was no loss of resilience from the compression of any part of the rubber. The channels were not as deep as in the Carmont type, and a larger percentage of rubber was available for wear. The rubber body was held into place by means of circumferential wires running through it and forming circles of smaller circumference than the rim flanges. Since the introduction of the Grant patent the use of solid rubber tires has increased steadily.

The Victor tire was similar in shape and construction to the Carmont and Grant, but the retaining wires were incased in leather to prevent their cutting the rubber. Later on, these wires were covered with specially woven fabric.

The next patented tire which was developed to any great extent was the side wire—a tire held into position by two endless circumferential wires sprung over the edges of the channel which engaged the ends of embedded cross bars, thus holding the tire securely in the channel.

These and many other solid vehicle tires were made and used on cabs, carriages, etc., until the vehicles became motor driven. The weight and speed of the motor vehicles increased as well as their carrying capacity, which made this style of tire altogether too light to perform the work required of it. This condition brought about the invention of the solid motor tire—a tire vulcanized in circular endless form to fit the dimensions of a wheel. This type has been brought out in different designs, such as a flange, internal wire, side wire, hard rubber and metal base; also the demountable.

Construction.

Vehicle tires were made in oval shape, in cross section from three-quarter inch to two inches, advancing one-eighth inch between sizes, and of compounded rubber which is forced through a tubing machine die, vulcanized in long molds with many cavities in the shape in which it has been designed. These tires were cut in lengths to fit the wheels and internal wires were inserted, of such lengths as to allow them to be spliced when applied to the wheel. The tires were then put into position in a channel on a wheel and held by mechanical devices while the ends of the wires were brazed together, the rubber having been pushed back, affording the wires sufficient space to allow this brazing process.

What is known as the cushion solid, which is perfectly round molded rubber in similar form, with a single hole through the centre of same for retaining wires, was put into use about this time.

The construction of the solid motor tires that have been put on the market up to the present time is very similar in a general way. The rubber is forced through a die of a tubing machine, or built up from thin sheets of calendered stock in endless form to fit the exact dimensions of a wheel, on a particular style of base or retaining body of the tire, as designed by the different rubber manufacturers, according to their various ideas of efficiency, which have taken various forms, such as circumferential and side retaining wires, which are engaged over embedded cross wires; base of hard rubber in various forms, also of semi-hard rubber which can be molded into the tire, and more recently, the plain metal base types which are most successful.

The rubber portion of a solid motor tire is usually about 2.75 inches high, and varies in width according to its design. The tire is built so that when it is applied over the steel band of the felloe of the wheel it fits so snugly that it has to be forced on with a press specially designed for this purpose. This is done so that the tire will not creep circumferentially or laterally. When the tire is in position on the wheel, it is further secured by steel flanges bolted on each side of the wheel, also to prevent its creeping or working off the wheel.

The side wire motor tire is built in similar shape, but cross wires are inserted throughout the base of the tire at stated intervals. It is placed in a channel made for this purpose and side endless circumferential wires are applied on each side of the tire over the ends of the cross wires in the base, which holds it in position in the channel. The tire in the channel is applied over a wood or steel band on the wheel.

Metal base tires are built up of compounded rubber in graduated consistencies from the hard base which forms their inside circumference next to the steel base to which it is vulcanized, to the resilient rubber that forms the wearing part of the tire. This rubber tire is vulcanized to a steel tire band which is applied by pressure to the wheel over the steel felloe band with either a hydraulic or specially built press. It requires from 60 to 90 tons pressure to apply these tires to a wheel and it has often been found necessary to use more than 90 tons to remove tires so applied. This frictional contact makes it unnecessary to use any side flanges or other fastening.

Size and Shape.

The size, shape and dimensions of these types of tires are varied according to the designs of the manufacturers—no two being the same in any of these particulars. The service obtained from a given diameter and cross section is as varied as the different types. The reasons for this can be attributed to the variation in the cubical contents of the cross section of the tire, some designs having a much greater amount of rubber than others, and, therefore,

*Extract from paper read before recent meeting of the Society of Automobile Engineers.

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the distribution of pressure over the different sizes of tires caused by the intensity of pressure a square inch brings a greater or lesser area of the tire in contact with the road, and as it is only that part of the solid rubber tire which is in contact with the road that is carrying the load, the tire with the greater area at this point performs the more satisfactory service.

The height of the rubber from the tire seat governs largely its elasticity and cushioning effect. A tire too high and narrow cannot stand up under a heavy load. It will weave from side to side. A tire worn down to a short distance from its non-extensible base loses its cushioning effect, and instead of the uneven conditions of the road being absorbed by the rubber, the tire is hard and transmits the shocks of bumping over it to the truck, and soon racks the truck and its motor, so that repairs become necessary.

Life of Tires.

The life, strength and durability of the tire lie primarily within the compounded rubber of which it is made, and also its construction. Other conditions being equal, the tire made of the highest grade of rubber has the longest life and is the most resilient. Certain minerals are added to give it strength and durability, the quantities being varied according to the best judgment of the tire manufacturer. The proper size tires which are dependent on the speed of the vehicle, applied on an electric truck driven at eight or 10 miles an hour, will give greater mileage and much longer life than the same size tires on a gasoline truck driven from 12 to 15 miles an hour. The carrying of a ton at a speed of 10 miles an hour is a very different proposition to a tire than carrying the same amount of load at 15 miles an hour. Greater mileage can be obtained from tires run in a city devoid of grades.

Heat is the result of motion, and as the tire when in motion is continually being pounded between the road and the steel band of the wheel, it develops a greater amount of heat within itself, which is transmitted throughout the tire, and has a tendency to shorten the life of the compounded rubber. The heat developed in solid tires is much less in the fall and winter and spring of the year owing to the cold roads, water, snow and ice. The number of months' service, as well as the mileage, that a solid tire may give is influenced by the same condition; also by the weight the truck has to carry, the speed at which it is driven, and the nature of the country where it is used.

Driving Wheel Diameter.

Tires on wheels of greater diameter give longer and better service, because of the greater area of rubber in contact with the road, as well as the fact that they do not have to travel so fast, and, therefore, do not generate as much heat, or deteriorate so rapidly. Neither do they travel so far and wear down as rapidly as the tires of smaller diameter. Actual experience has demonstrated that big wheels and tires are better on heavy grades in particular.

Tires for Electric Vehicles.

A solid motor tire for an electric truck must be made from a compounded rubber stock which is soft and most resilient. It must absorb the unevenness of the road, and resume its normal shape instantly, so as to lessen the traction of the vehicle. By the absorption of the shocks the consumption of electric current necessary to drive the truck is reduced to a minimum. This is largely dependent upon the resiliency of the compound, as well as the shape and size of the tire.

Many shapes have been tried out for use on electric trucks—the standard oval shape prevailing. The corrugated or grooved treads present less road contact and assist in preventing skidding. Tires molded with these grooved treads and under-cut webbed sides afford an additional cushioning effect and are very successful on electric vehicles. The styles of tires used on electrics are the same as those offered for other classes of vehicles. The size of the cross section also affects the cushioning qualities of the solid motor tire on electric trucks, and a fair comparison cannot be drawn between two makes of tires, one of which is approximately eight square inches in area for four-inch section, and the other 10 square inches; for the one with the greater area will cushion and carry a greater load, absorb the shocks better, give longer life, and better service.

The life of the tire on electric vehicles is much longer than on gasoline machines—due partially to the low speed on the vehicle. From this class of vehicle being run at lower speed, it is handled with much more care than a high speed truck; therefore, unknowingly, the tires receive more consideration.

Dual or Twin Tires.

Dual or twin tires are applied on the rear wheels of trucks built to carry heavy loads, and subjected to the most severe strains, as it is known that when these dual tires are of the proper size they have greater sustaining power from the distribution of the load over the two tires on a single wheel. However, it is frequently demonstrated that one of the twin tires gives out before the other—due to the fact that they have been driven over uneven roads where one of the tires on the wheel has had to carry the entire weight of its wheel a greater portion of the time and has given out from being overloaded.

Block Tires.

Block tires are sections of solid tires vulcanized to steel plates or held in position by steel sectional frame fitting over the blocks of rubber with a wider base, or protruding wires in the base. This style of tire is used principally in duals on the rear wheels of the larger motor trucks subjected to most severe work. When driven rapidly, there is but little unevenness of motion felt from the tire being so constructed. It does not generate heat within itself as rapidly as a solid tire, owing to the fact that there is a space of an inch or more between the blocks which enables the rubber to yield more as it rolls up ahead under the travelling load. There being no communicating rubber between the blocks, the heat is confined in each block, which can be removed or replaced when it is injured or worn.

Block tires afford a very good non-skidding quality, and are excellent on soft roads, as there is but little slipping in wet, slippery places. In winter the spaces between the blocks pack with snow and ice, and the tire then loses its non-skidding and gripping effect. In all seasons the block tire picks up stones between the serrations, and these small stones embed themselves in the rubber, and should be taken out with a strong screw driver or any other similar tool before they have time to cut and work into the blocks of rubber.

Demountable Tires.

The demountable solid motor tire has been too long delayed. The cost to the tire maker, truck manufacturer, and the truck owner, of the delay of laying up the truck while the wheel is taken off and sent by express to the nearest branch or factory of the tire manufacturer and the old tire taken off and the new one applied is entirely too great. This expenditure of time and money will be avoided when tires are all demountable and interchangeable like pneumatics for the pleasure car.

Tire Troubles.

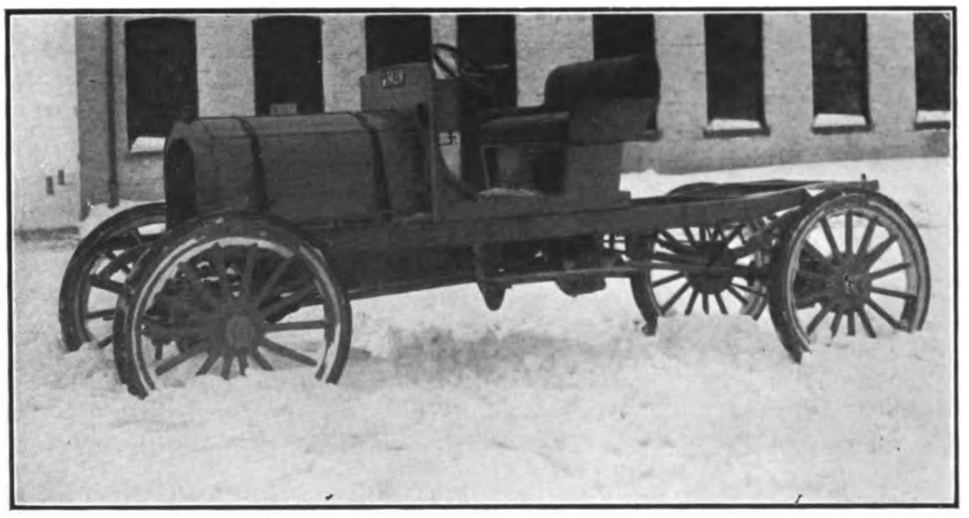
The greatest of solid motor tire troubles is the separation of the tread from the base before the tire has given satisfactory mileage. While some of the troubles have been due to the construction of the tires, the principal causes

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have been overload and overspeed. The truck manufacturers have not equipped their trucks with tires sufficient in size to do work demanded of them. The tendency is to under-rate the overload that is going to be put on the truck soon after it is turned into service, just as in the case of pleasure cars until recently. Sufficient allowance has not been made for the portion of the load that is carried on the rear wheels, and trucks are daily equipped with undersize tires that will go to pieces within 2000 or 3000 miles instead of lasting 6000 or 7000. Truck manufacturers will some day learn that the reputation of their trucks for "eating up tires" costs them more than the difference in cost between undersized and proper size tires—a great many times over.

Standardization.

This point leads us to the standardization of the tire and wheel dimensions and fastenings, which was accomplished by the Society of Automobile Engineers on July 15, 1911. What does this mean to the tire manufacturer? The expenditure of thousands of dollars to make an entirely new equipment in which to make his solid tires to conform with the new dimensions that the S. A. E. standardized. What does this mean to the wheel and truck manufacturers?



Four Wheel Drive Truck Purchased by Government for Quartermaster's Department and Which Participated in Army Manoeuvres at Washington.

A saving of thousands of dollars, instead of having to carry as many wheels in stock as there are varieties of tires to fill an order for any given size. The S. A. E. standardization has reduced this to one wheel for any make of tire for any given size.

The time will come when the cubical contents of the tire will be standardized, also the demountable fastening, so that the difference in service of any given size tire will be measured by the difference in the quality of the compounded rubber that it is made of by the different tire manufacturers.

Conclusion.

The pneumatic and the solid motor tires have made the development of the pleasure car and motor truck possible, and yet they have been given less serious consideration than any other part of the equipment. A given amount of rubber and fabric can perform only a measured amount of work, the same as steel and other products, and when it is overtaxed its life is shortened exactly in proportion to its abuse.

FIRESTONE ISSUES TIRE BOOK.

Any information relative to the care and maintenance of tires is appreciated by the owner and operator of mechanical transports. The Firestone Tire & Rubber Company, Akron, O., is issuing a booklet entitled "Minor Repairs and the Care of Tires." As the title indicates it describes the best methods for making repairs to tires and inner tubes and the brochure also contains a number of suggestions on their care and preservation. The booklet will be sent free upon written request to the Firestone Tire & Rubber Company, Akron, O.

GOVERNMENT TESTS FOUR WHEEL DRIVE.

Announcement is made by the Four Wheel Drive Auto Company, Clintonville, Wis., that it has constructed and shipped to Washington, D. C., a 1.25-ton truck which is to be utilized in the army manoeuvres planned by the government. The order was the result of a visit to the factory by a representative of the War Department who subjected the machine to severe tests. Owing to the short time allowed in filling the order, the company was obliged to fit the chassis with a remodelled touring body as depicted in the accompanying illustration, the picture being taken on the day of shipment.

The vehicle is propelled by a four-cylinder, four-cycle, water-cooled motor having a 4.75-inch bore and 5.5-inch stroke, and rated at 45 horsepower. A multiple disc clutch is fitted and a sliding gear transmission, back of which is a sub-transmission consisting of Morse silent link chain and gears. Inside the driven gear is placed a differential, from which two shafts drive to bevel gear differentials on both axles, all four wheels driving.

On the shafts, near the sub-transmission, is a patented locking device, one for each member, which are utilized as an emergency device for operating an opposite pair of wheels in the event of serious damage to either shaft or axle. Both axles are of the full floating type and the front member is fitted with the Four Wheel drive patent with ball and socket steering joint enclosed, and the universal joint permits the machine to be driven and steered by the front axle arrangement.

NEW DEPARTURE BALL BEARING DATA.

The New Departure Manufacturing Company, Bristol, Conn., maker of ball bearings of that name, is mailing the trade an interesting 76-page catalogue, the contents of which give valuable information of technical character pertaining to ball bearings. The book will be mailed on request to manufacturers, purchasing agents, designing and mechanical engineers. The New Departure Company suggests that applications be made upon the letter head of the firm with which the person is connected.

PLATINUM RISING IN VALUE.

The price of platinum is rising, this being due, presumably, to the enormous demand for the material in automobile construction. According to an official of the Remy Electric Company, Anderson, Ind., the material was quoted recently at $650 a pound in Berlin, Germany, which is one of the centres of the platinum trade of the world.

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ELECTRIC VEHICLE BREVITIES

The mechanically propelled vehicle is rapidly replacing horse drawn equipment for transporting hotel guests to and from railroad stations. Not only is the service more comfortable but considerable time is saved and the progressive hotel men find the automobile useful for various other purposes, such as hauling supplies and carrying guests on trips to places of interest in the neighboorhood. The accompanying illustration presents a Detroit electric hotel 'bus, made by the Anderson Electric Car Company, Detroit, Mich., and placed in service recently by the Hotel Brazos, Houston, Tex.

The vehicle provides seating capacity for 14 persons in addition to the driver and the feature of the body is the placing of a roomy luggage rack on the top. This not only does away with the blocking of the aisle, an annoyance to the occupants of the car, but permits of carrying the baggage on the same trip. The rack is reached by means of a ladder.

The windows of the machine are of French plate glass, arranged so as to be dropped in warm weather and equipped with an anti-rattling device. The interior is lighted by electricity and the chassis is suspended on well designed springs insuring easy riding qualities. The battery, which is located amidships, consists of 60 A-6 Edison cells. Final drive is by side chains to wheels which are fitted with solid tires, 36 by four inches. The front members are also single, solid, 34 by 3.5 inches. The speed of the automobile is 11 miles an hour. One of the features which attracts the attention at night is the use of an electrically illuminated sign on either side of the luggage rack.

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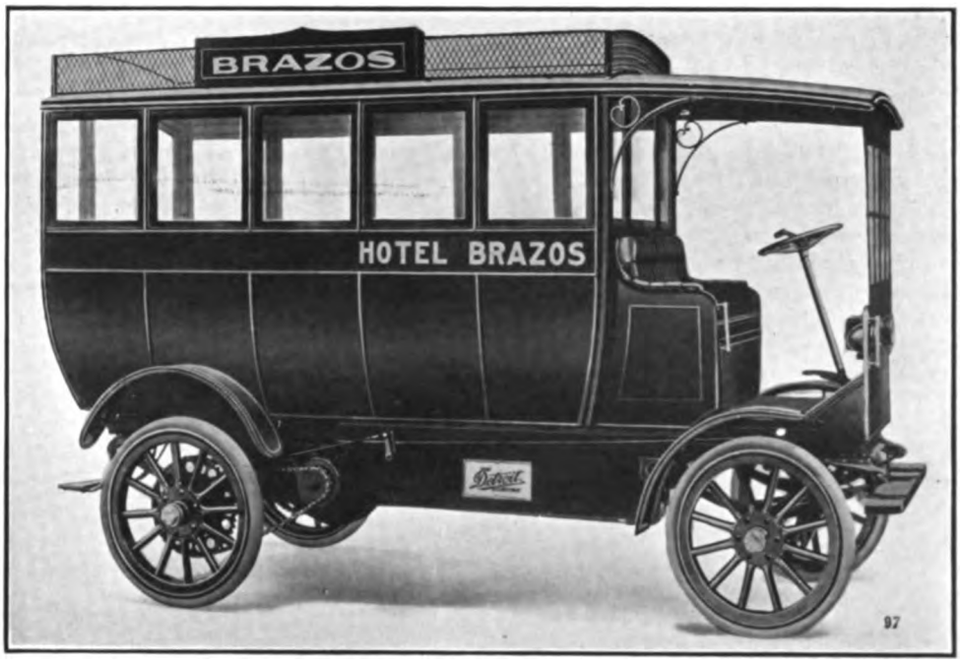
Day Baker, New England manager of the General Vehicle Company, Long Island City, N.Y., gave a stereopticon illustrated lecture before the New England Foundrymen's Association at Boston recently. He showed a large number of pictures presenting the progress of the electric vehicle from 1886 to the present. Of particular interest were the illustrations of baggage and factory trucks, six of which have been installed in the North station at Boston. The devices for factory work are operated at a moderate speed and are capable of carrying a very heavy load. A form of carrier utilized by large beef dealers also was explained and illustrated.

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Realizing that the electric commercial and pleasure vehicle are entering upon a new era of prosperity and that the use of the former will be very largely increased throughout the country, the Westinghouse Electric & Manufacturing Company, Pittsburg, Penn., has mapped out an extensive campaign for the more general use of its electric motors for vehicles of all kinds.

At present about 24 makers are using the Westinghouse motor as a standard equipment. The concern has made a specialty of motors and controllers together with charging apparatus for batteries, for years, and it is the plan of the company to give every prospective owner of an electric vehicle the service of the Westinghouse Company regarding expert advice on the different kinds of equipment. This service will also be given freely to garage men, trucking companies and manufacturers who desire the opinions of the consulting engineer.

Standard vehicle motors are made in different forms for commercial vehicles including everything from those employed in transporting baggage in railroad terminals to the heavy duty types for trucks. The proper selection of a motor requires a careful study of a number of factors, of which the most important are: The character of the vehicle, its speed, the method of drive, and maximum weights when empty and loaded.



Detroit Electric Hotel 'Bus Which Was Placed in Service by the Hotel Brazos, Houston, Tex., Recently—The Vehicle Is Fitted with Electric Sign and Luggage Carrier on Top.

The first electric commercial vehicle to be constructed in Youngstown, O., was completed recently by the Youngstown Electrical Garage Company, the firm being composed of A. F. Clauss and Fred McVean. The machine has a carrying capacity of 1000 pounds, is capable of attaining a speed of 15 miles an hour, and is said to obtain 65 miles on one charge of the batteries. The price of the new car has not as yet been decided upon. Orders have been received for five machines and it is said the company will move into larger quarters.

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After an experience of several years in designing, building and maintaining commercial vehicles, the Walker Vehicle Company, Chicago, Ill., has brought out the Walker balance drive for which is claimed simplicity, reliability and efficiency, as well as the elimination of

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chains, shafts, etc. The power plant is all enclosed in the hollow rear axle and rear wheels and it is said this arrangement is not affected by load or road conditions, and

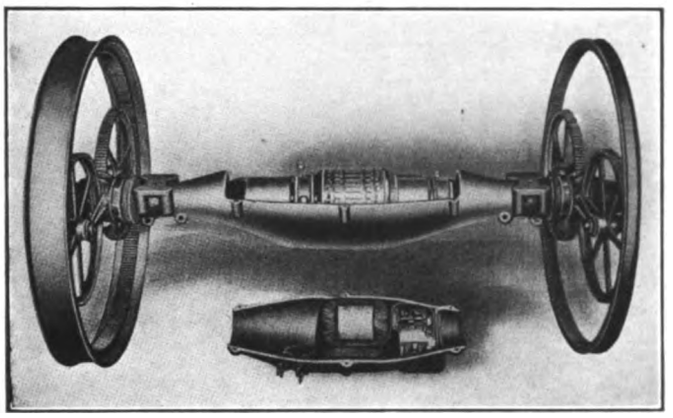


Fig. 1—Showing Compact Power Plant and Construction of Walker Balanced Drive.

that all moving parts are in perfect alignment, fully enclosed, dirt proof and very accessible.

A single motor is employed, this being housed in the rear axle, and power is transmitted through the directly connected differential and the two drive shafts extending from sockets in the differential into each rear wheel. Each shaft is equipped with a pinion at the wheel end and transmits the energy through idler gears to the large rim gears fastened to the tire rims of the wheels as will be noted in Fig. 1. Two idler gears are utilized in each wheel. The one differential is directly connected to one end of the hollow armature shaft.

The operation is obvious. The motor and direct differential drive the shafts, the pinions of which impart motion to the wheels by means of the idler and the rim gears. The drive pinions and shafts have no bearings except the teeth of the idler gears between which the pinions float in a balanced manner, this making for durability.

The motors are designed to meet the severest demands, and are said to be of ample capacity to perform the work continuously with the greatest efficiency. The hollow armature shaft runs in large imported Hess-Bright ball bearings. As will be noted, the motor, differential and drive shafts are all on the centre line of the axle and the power is developed on the centre of the axle and transmitted in balanced, opposite directions to each wheel.

The rear wheels are of special design, of ample diameter, and enclose the driving mechanism. The sides are formed by two pressed steel discs with radial corrugations in the form of spokes, which, in combination with the dished shape of the discs make for great strength and durability. They are mounted on Hess-Bright ball bearings of ample dimensions. The wheels are partly filled with lubricant, which is distributed over the working parts continuously when running and being oil tight prevent dust and dirt from entering as well as accumulating on the exterior. Drain plugs are fitted for the purpose of replenishing the supply or removal of old lubricant.

The disc type wheel is also utilized in front and these are mounted on Timken roller or Hess-Bright ball bearings. The front axle is a one-piece drop forging of I beam section type. The steering knuckles and front wheel stub axles are integral drop forgings of nickel steel and the use of Timken roller bearings not only makes steering easy but reduces wear and permits of adjustment.

On the standard design a triangular reach of channel section steel extends from the extremities of the front axle to the chassis frame where the two ends unite in a ball joint, this arrangement, which is depicted at Fig. 2 D, providing an extra bracing as well as absorbing road shocks, and the ball joint permits the axle to assume any angle which the road surface necessitates.

The Exide battery is furnished unless otherwise specified by the purchaser, and is located amidships, being supported by substantial steel cradles. It is accessible through a trap door, also side doors on either side of the container, this facilitating examination of cells.

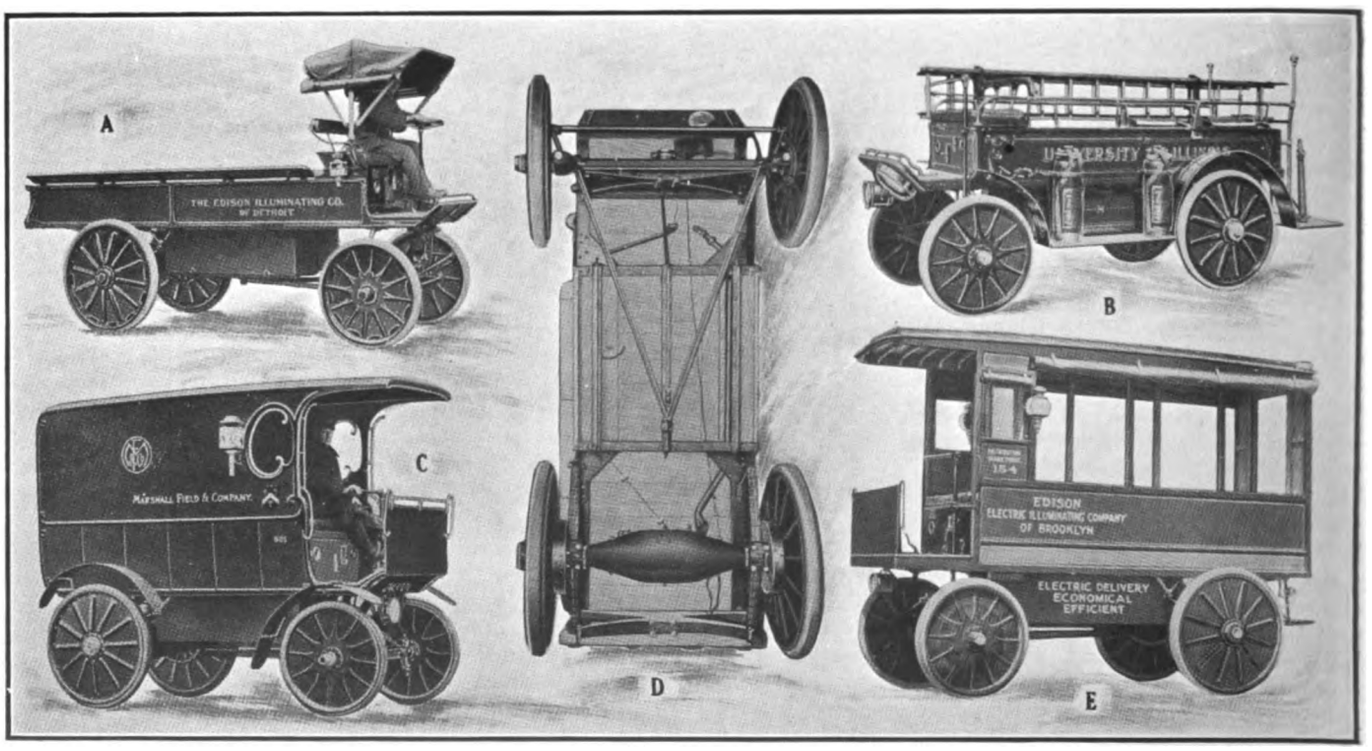


Fig. 2—Depicting Different Types of Bodies Fitted to Walker Balanced Drive Chassis: A, Flare Board Express; B, Combination Hose and Chemical Wagon; C, Panel Delivery; D, Showing Simplicity of Chassis Construction; E, Screen Body.

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Four speeds forward and one reverse are provided, all controlled by the left hand, while steering is by wheel or lever with driver at the left. Two pedals are employed, one for the brakes, the other controlling the reverse, which is operated through the controller. Option is given in the matter of steering, a hinged horizontal hand lever or usual wheel being listed.

An ampere-hour meter is fitted to the dash in plain sight of the operator who may tell at a glance how much current has been consumed, this enabling the driver to operate in the most economical manner. It is claimed that the Walker drive is productive of 20 per cent. greater battery mileage, as all friction practically is eliminated. Regarding the mileage it is claimed that the minimum is 40 and maximum 80, according to the equipment.

The Walker vehicle is manufactured in normal load capacities ranging from 750 pounds to 2.5 tons, and the maximum speed varies from eight to 15 miles an hour. The battery, body, loading space and wheelbase are optional to suit the requirement of the purchaser.

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In his address before the members of the Electrical Vehicle Association of New York City, recently, Stephen G. Thompson brought out some pertinent facts regarding the influence of the central power station on the use of electric commercial vehicles. In discussing the subject, "Is Central Station Activity in the Electric Vehicle Justified?" his general conclusions were that it is and that the electric is entering an increased field in commercial utility.

"It is estimated that 20,000 commercial machines are now in operation, and that within a year this number will be increased to 45,000 and in 1915, 200,000 will be in service, representing an investment of some $500,000,000," said Mr. Thompson. "The number of electric commercial cars is at present estimated to be 5000 of which 40 per cent. is employed in some 40 installations. This condition presents a new phase of the electric vehicle situation, and indicates a tendency on the part of the manufacturers to concentrate their efforts on a few customers and in the larger cities, thereby neglecting the less thickly populated territories.

"By cultivating this field the gasoline commercial car makers have been able in the past few years to market 200 per cent. more machines than have the manufacturers of electrics since their first entry into the market, and have emphasized the popular belief that the electric automobile is fundamentally for use in the larger cities alone.

"Of course, one may argue that in consideration of the number of gasoline vehicle makers, who outnumber the active electric commercial manufacturers in a ratio approximately 30 to one, the percentage of gasoline machines in excess of electrics is no indication that the makers of the latter type have been remiss in their efforts. However, the truth must be recognized that it is due more to the energy of the salesmen and agents of the internal combustion motor car than to any superiority of the machines themselves, that in a few years this type of automobile should dominate the market.

"If there be any truth in the oft reiterated statement that the electric will represent 65 per cent. of the total number of commercial vehicles employed at the end of 1915, instead of 50,000 electrics and 150,000 gasoline cars, based upon the present ratio, there should be 130,000 electrics and 70,000 gasoline; and it is this fact alone that justifies the central station in actively promoting the introduction of electric vehicles. There is no especially good reason why cities of 50,000 inhabitants or more should not present a fertile field for the sale of the electric in competition with gasoline cars, in that such communities represent the hub of a business area whose road transportation is confined principally within the city limits, while the bulk of suburban delivery is well within the economic zone of operation of an electrically driven machine.

"That the central stations are fully alive to the situation is evidenced by their present activity, which needs but the equivalent co-operation on the part of the vehicle manufacturers to precipitate an unprecedented electric boom. Many of the obstacles which opposed the early introduction of electrics have been removed. Excessive charging rates are a thing of the past.

"While some manufacturers entertain the belief that the charging facilities should be supplied by the central station for each individual user, the contention might just as logically apply to the free installation of motors, fans, etc. It would appear more rational to assume that the sale of a vehicle should include all accessories required for its proper care and operation.

"That the central station co-operation is effectively increasing the number of electrics in operation is manifested by the reports of the manufacturers themselves, who testify to an unprecedented demand for this type of machine, and that there is every indication that the central stations have more than performed their duty in nursing the electric vehicle industry to a state of healthful development.

"In Boston, New York City, Cleveland, Chicago, Detroit, Indianapolis, St. Louis, and many other localities, the increase in the number of electric vehicles has been quite marked; in some instances reaching 300 per cent. The aggregate increase is sufficient to warrant the belief that continued co-operation will produce a demand for electric machines far beyond the capacity of the present manufacturing facilities, and justify the prophecy that the time is not far distant when the general use of the electric vehicle may be expected to tax to the limit the existing central station installations."

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Crowley, Milner & Co., a large department store of Detroit, and Toledo, O., has adopted the electric vehicle, having placed an order with the Anderson Electric Car Company, Detroit, for five Detroit electric trucks. Three of the fleet will have a carrying capacity of 1000 pounds and will be equipped with special delivery bodies. The remaining automobiles will be of the 1.5-ton type, fitted with furniture bodies with carrying space 13 feet long and six wide. Crowley, Milner & Co., made a careful and thorough investigation of the capabilities and possible service to be secured from various types of cars and decided upon the electric after it had demonstrated successfully its ability to make runs to Grosse Point, Wayne and other suburbs, 12 to 15 miles distant from the heart of the city.

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The Springfield, Mass., fire department is to have another electrically propelled ladder truck similar to the one stationed at the Court street headquarters, this step having been decided upon by the fire commissioners. The new apparatus will cost about $10,000, it is stated, and will be installed in the new addition built recently to the Pine street station, affording better protection to that district, which has heretofore relied upon the horse drawn equipment. The new machine will be of the Couple-Gear storage battery type, made by the Couple-Gear Freight-Wheel Company, Grand Rapids, Mich.

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The Edison Electric Illuminating Company, Boston, is planning one of the largest garages of the country for housing electric vehicles. It will be located on Commonwealth avenue, as a part of a large service plant.

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FOX SYSTEM OF POWER PLANT SUSPENSION.

Unit Motor Clutch and Transmission Assembly Protected from Chassis Frame Distortion, and Rear Axle and Shaft So Designed as to Be Relieved of Driving Stresses and Road Shocks.

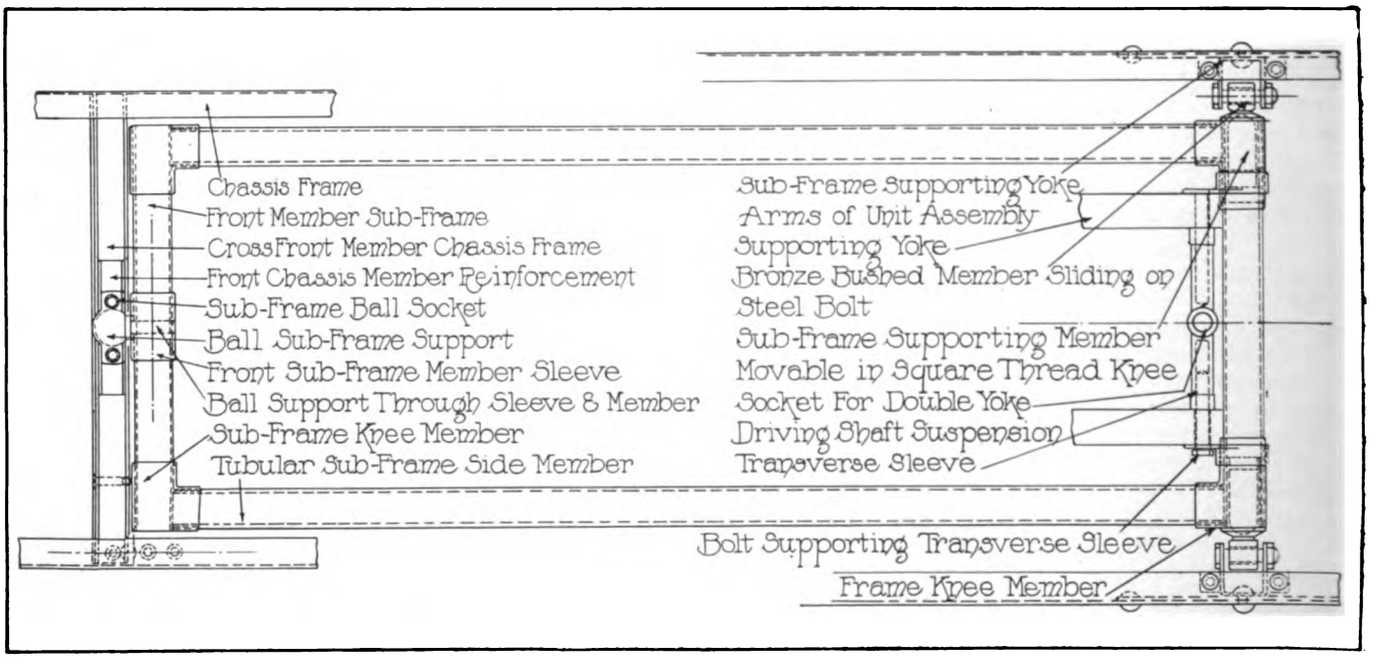
By Joseph P. Fox.

WHILE a motor vehicle chassis may appear to be a perfectly solid assembly while at rest so far as the unity of its members is concerned, when in motion it is subjected to stresses proportionate to its velocity, the load carried and the condition of the surfaces over which it is driven. These stresses are resultant from the shocks primarily communicated through the tires and wheels, axles, springs and frame. As the wheels may move or rest in a different plane the influence from each wheel may be more or less, unitedly or differently directed. The result is that the chassis frame is constantly subjected to twisting or distorting strains, which may be multiplied rapidly by the speed and road surfacing.

It is not practical to resist these stresses by heavier construction. It is essential to have light weight for many reasons. These facts have been long understood by engineers and manufacturers, who have sought to minimize the stresses by methods more or less productive of results. One design to receive material consideration has been the suspension of the power plant from three points, the purpose being to minimize the effect of the frame distortion which in turn is communicated to the engine case, the bearings and the shafts of the motor. Practical experience and theory have established the necessity of every moving part being in its precise relation to prevent the loss of power through excess motion or cramping of the mechanism. It is apparent that a very slight variation at a given point may be multiplied many times at another.

Then if this frame distortion cannot be prevented it must be compensated so far as possible. Three point suspension as applied by designers has many forms. It having been accepted as an engineering principle it has been employed to lessen the strains upon the motor or transmission cases, the bearings, gears and shafts, but as adapted by many the results have not been satisfactory. This has been due to the rigid installation of the motor or transmission in the chassis frame. Careful consideration of the proposition must establish conclusively that there can be little difference in results experienced from either three or four point suspension if the points for suspension are broad and firmly secured to the chassis frame.

Supporting arms of sufficient strength to carry the weight would undoubtedly strain or distort the engine case if immovably fixed. Then to obtain the precise result desired the means of suspension must not be rigidly fastened, but must be so designed as to maintain a perfect relation of members no matter what the influence of operation upon the chassis. That is to say, the mechanism to be preserved from the strains and stresses should have such movement as will compensate for the distortions or twists of the chassis frame. To accomplish this many constructions have been adopted, some by leading manufacturers.



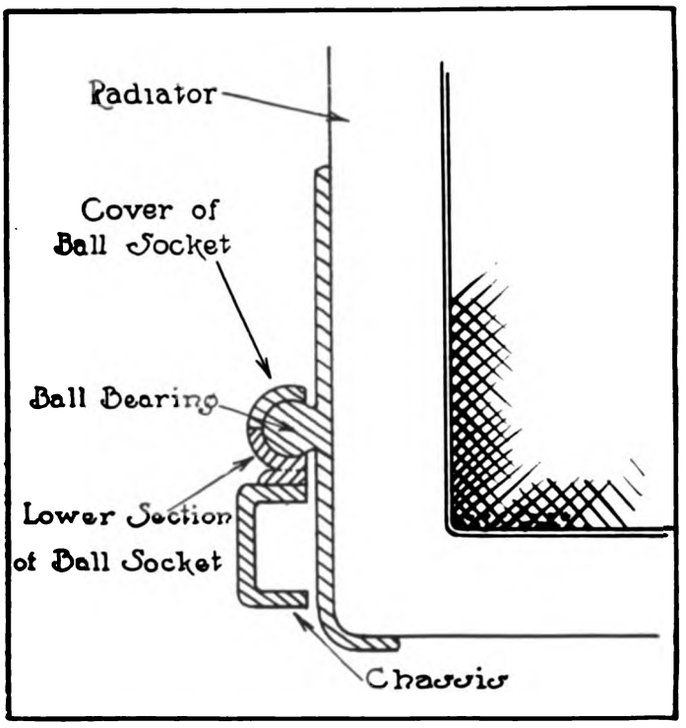
Plan View of the Tubular Sub-Frame Carried by Ball and Socket Bearing at the Front and by Sliding Side Supports, Designed for the Fox Public Service Cab.

Daimler Truck Suspension.

An example is the latest Daimler truck, which has not only three point suspension for the motor, but for the transmission case as well. Both engine and transmission case have as one suspension point a large ball and socket, that for the motor being at the front of the case and for the transmission at the rear. Both motor and transmission cases have two swivelled bearings at the other ends. These swivelled suspension bearings are rigidly fixed, the purpose being to eliminate the twisting movement of the side members of the chassis upon the engine and transmission casings by the turning of the ball bearings in their

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sockets. The intention is to compensate for the rocking motion of the frame. While this construction will no doubt afford relief from some of the strains of the flat, sinking



The Ball and Socket Mount for the Radiator That Eliminates All Twisting Strain.

movement of the chassis, it would appear that the peculiar assembly of the suspension points, as well as their rigidity against any bending motion of the frame, would be ineffective to protect the power plant against twisting strains.

There are many different forms of three point suspension, or at least applications of the principle. Some of the manufacturers who have adopted it have not redesigned their chassis, but have designed a form that may appear to be best suited to meet the requirements in the cars they build. The construction of many power plants is not such as to make possible the use of a true three point suspension and such vehicles may have the name but not the quality the term implies.

Value of Three Point Support.

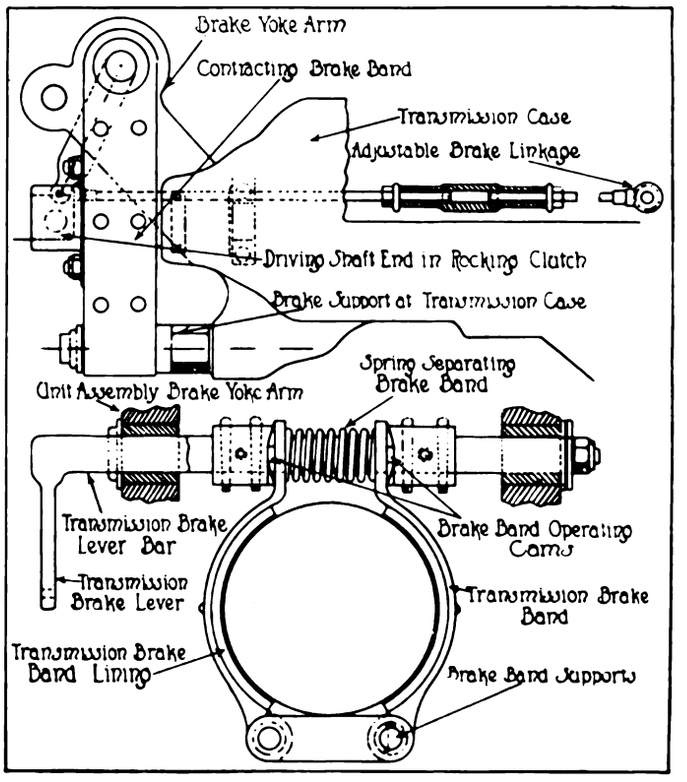
The writer is of the opinion that there is no feature of car design paramount to three point suspension, and believes that the results obtainable are well worth the expense and trouble of reconstruction. But better still would be the designing and building of a power plant having all advantages of an actual or ideal three point suspension. This means that the power plant should be of the unit type in which the motor, clutch, transmission and gear shifting levers are assembled in one casing, this assembly being suspended in the frame from three points. The assembly should be so constructed as to rock or glide in a manner that will protect it, even on the worst roads, from all bending or twisting strains of the frame. With such construction the main shafts of the motor and transmission are sure always to be in line, thus dispensing with the usual universal joint between the two shafts and relieving the shaft bearings of all undue strains. When the engine and transmission are each suspended independent of the other in the frame of the car, even though each has a three point suspension, it is necessary to use a universal joint between them, so that in reality there is six, instead of three, point installation. The universal joint between the motor and the transmission at best but partly compensates for the influences of the twisting frame. The shafts are not in true line when the frame is twisted and the universal joint is expected to prevent shafts springing and excessive wearing of bearings. Universal joints cause friction and loss of power, are often noisy, require care and attention, and, worst of all, because of irregular transmission of power, cause shocks that affect the shafts and bearings, which theoretically ought to be free from friction. For the reasons stated the writer is of the opinion that the entire power plant should be suspended on three, not six, points. These conclusions were the reason for the design of the motor, clutch and transmission as shown in the description of the Fox cab.

Unit Power Plant Necessary.

This design has been worked out to have construction that will not be susceptible to the stresses upon the chassis, will maintain alignment of shafts and bearings, and compensate for any force that will create friction and result in lost power. To secure these results it has been found most practicable to use a tubular sub-frame, the plan view of which is shown herewith. This has been shaped to carry the full assembly and relieve it of practically all stresses. This frame carries the entire power plant, which is supported at either side by a wide flange or web extending from the front end to a point about the centre of the clutch housing. Besides firmly anchoring the plant this flange so strengthens it that it cannot be distorted by the greatest strain or shock it may be subjected to.

Sub-Frame in Fox Design.

By reference to the illustration the form of the sub-frame is shown, and into this frame is seated the engine, clutch and transmission assembly. The frame is of suitable tubing. The power plant is bolted to the sub-frame. The rear end of the plant is carried on the arms of a yoke supported by a bar which is parallel to the rear member of the



Plan of Construction of the Transmission Service Brake and Its Supports.

sub-frame. The side flange serves as a drip pan and protects the motor from water, mud, dust and road accumulation, quite as well as a sheet of metal.

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A sleeve is fitted to the centre of the front sub-frame member which is the support for a ball shaped bearing. This bearing is supported by a ball socket centred on the top of the front member of the chassis frame. The upper half of the socket is fastened to the lower by bolts and nuts. By removing the nuts and the upper half of the socket the forward end of the sub-frame may be raised, the rear supports being designed to permit this movement.

The rear supporting members E are screwed easily into the knees at the ends of the rear member of the sub-frame by square cut threads, which permit an easy rocking movement in the event of the chassis frame twisting, or should the forward end of the power plant and sub-frame be lifted. The outer ends of the supporting members are bored and bushed with bronze and these bushings are secured by bolts to yokes having flanges riveted to the upper and lower sides of the channel section chassis frame side members. These supporting members have a longitudinal movement on the bolts. Obviously the movement of the chassis frame is least in the centre and greatest at the ends. Should there be any lifting or twisting motion of the frame sides the sub-frame will rock on the ball and socket bearing. Should there be forward or backward motion the sub-frame side supports will slide correspondingly on the supporting bolts. There will be no stress upon the shafts or bearings.

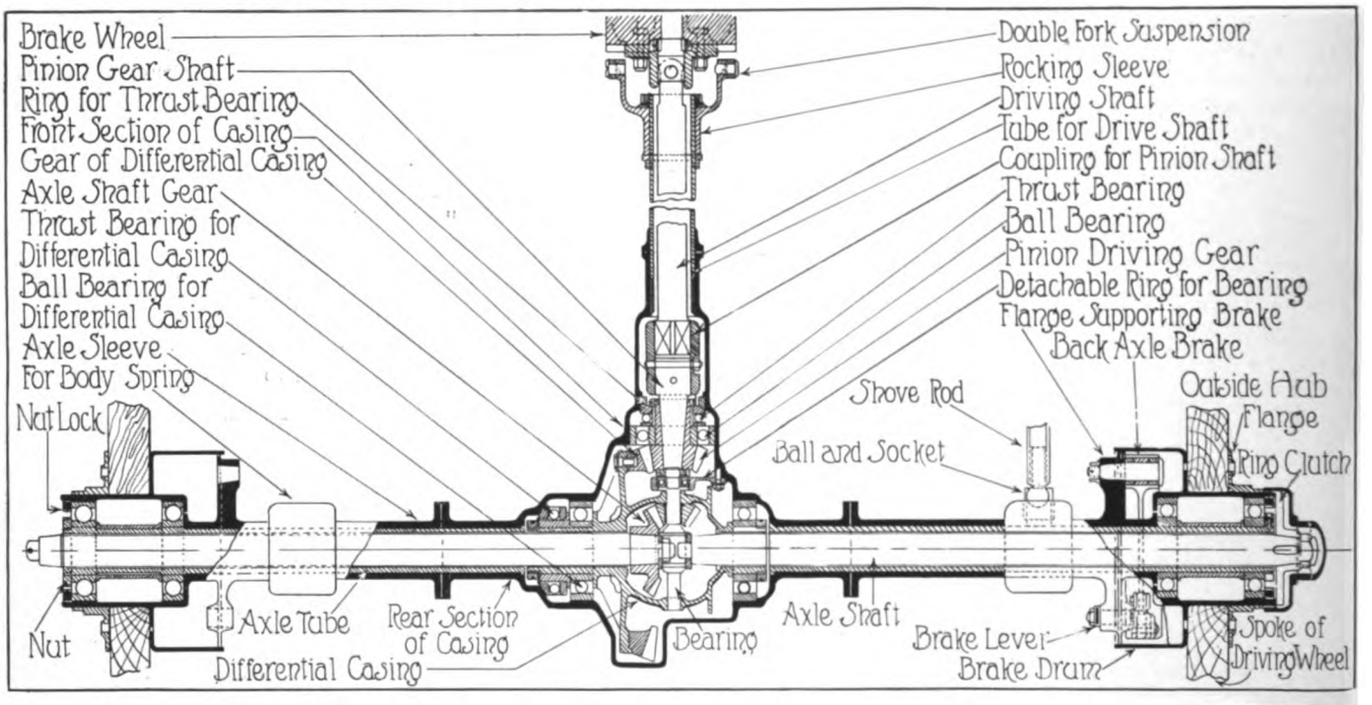
Time Economy a Large Factor.

This form of suspension minimizes the labor of assembling a power plant, a matter of decided importance with cab owners, for spare power plants may be used and the chassis kept in operation in the event of engine defect or failure. With proper facilities and skilled workers the plant may be removed and replaced by another in an hour. Under the conditions usually existing today such a change would require from one to two days and perhaps longer. As may be noted, it is only necessary to remove the upper half of the ball and socket support to free the sub-frame so that it may be raised.

As the motor is firm in the sub-frame, and the sub-frame has such suspension at the rear that it may move slightly in a longitudinal direction, and it may rock or swing at the forward bearing, it will be seen that it is free from all twisting strain. This relieves the motor shafts and bearings from all stresses and, strengthened by the supporting web, the engine case cannot sag. The section of the motor assembly back of the crankcase, containing the flywheel and the transmission, is also rigidly held by this construction, and yet any movement of the shafts is perfectly compensated. By making further reference to the sketch, it will be seen that the rear sub-frame member carries near the outer ends two firmly fixed sleeves, to which are fitted lugs. These lugs are bored and through them, paralleling the rear sub-frame member, is a transverse bar that may turn on the bolts that retain and support it in the sub-frame. From this bar is suspended a yoke that may move backward or forward by the swing of the bar or from side to side, this in effect being a universal joint. Into this yoke is bolted the yoke of the tubular driving shaft housing, affording a substantial but flexible suspension.

Transmission Brake Support.

The rear end of the motor assembly case carries arms for the suspension of the transmission brake band, which is the contracting type, the brake lever and the supporting rod. By following the driving system through from the engine crankshaft it will be seen that the crankshaft rear extension carries the flywheel and the movable clutch member. The cone of the clutch is on a sleeve that engages with a clutching member carried on the end of the driving shaft of the transmission. This shaft is coupled to the continuation of the transmission driving shaft. On this continuation of the transmission driving shaft is mounted the transmission brake wheel or drum. Attached to the brake wheel is a rocking clutch, so-called, in which the forward end of the driving shaft is socketed. This rocking clutch permits movement of shaft in all directions without causing a strain. This driving shaft is carried in its tubular housing held by the yoke suspended from the rear of the sub-frame. As the shaft is free to move longitudinally in a squared sleeve at the rear end there is a slight telescoping movement which compensates for the motion of the rear axle. It will be seen that there is no strain upon the shaft as the chassis frame rises or falls upon the springs,



Plan View of the Driving Shaft and Rear Axle Assembly for the Fox Cab, This Showing the Reinforcement of the Sectional Axle Housing, the Strong Wheel Bearings, and the Means for Compensating Road Shock Stresses.

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or when there is a twist of the frame. There is no thrust upon the shafts or the bearings at any time.

Considering the construction it will be seen that while the motor is held in the sub-frame and protected by this suspension from any strains or stresses, this same sub-frame carries the forward end of the driving shaft housing and, as there is allowance for movement of the chassis frame, the sub-frame and the shafts, there can be none of the stresses and but a small degree of wear as compared with a design in which all of these elements are rigid. It will be apparent that with imperfect suspension but little movement may cause bearings to be jammed, shafts to be bound so as to cause excessive friction, gears to be thrown from the precise relation necessary for efficiency, and other conditions precipitated that will cause lost power and destructive wear.

Driving System Protected.

Examination of the entire driving mechanism of the cab will demonstrate that the elimination of shocks and stresses has been carefully studied. Beginning with the clutch and concluding with the contact of the traction wheels upon the road it will be understood that there has been endeavor to have an elastic construction that will have every desirable quality. Considerable emphasis has been made upon the three point suspension of the sub-frame and the power plant, but it is also apparent that the driving shaft and the rear axle construction are given material protection through the yoked connection of the forward end of the driving shaft housing, which will yield slightly to compensate any straining movement, and the freedom of the semi-elliptic springs to move and cushion the road shocks. With the full floating type rear axle the axle housing sustains all the weight and the axle shafts and differential are protected against every influence so far as this may be done.

In explanation of the driving system it may be pointed out that the engine crankshaft, carried on five ball bearings, is always free from stresses. On the rear end of the crankshaft is carried the flywheel and this is very close to the rear main bearing to prevent vibration. The shaft is tapered and the flywheel is keyed on it and further retained by a locking nut held by a pin and a locking spring. Into the hollow end of the crankshaft is screwed a shaft extension or spigot which is also retained by the pin and locking spring. Surrounding the spigot is the clutch spring which is compressed and normally holds the clutch engaged by expansion. Back of the spring is a collar and then a ball bearing, and next is the adjustable collar by which the clutch spring tension is established. The flywheel is with the face divided, the inner face of the rear ring or section of the wheel being machined to the same angle as the clutching member. The flywheel is of cast iron, the clutch cone member of aluminum.

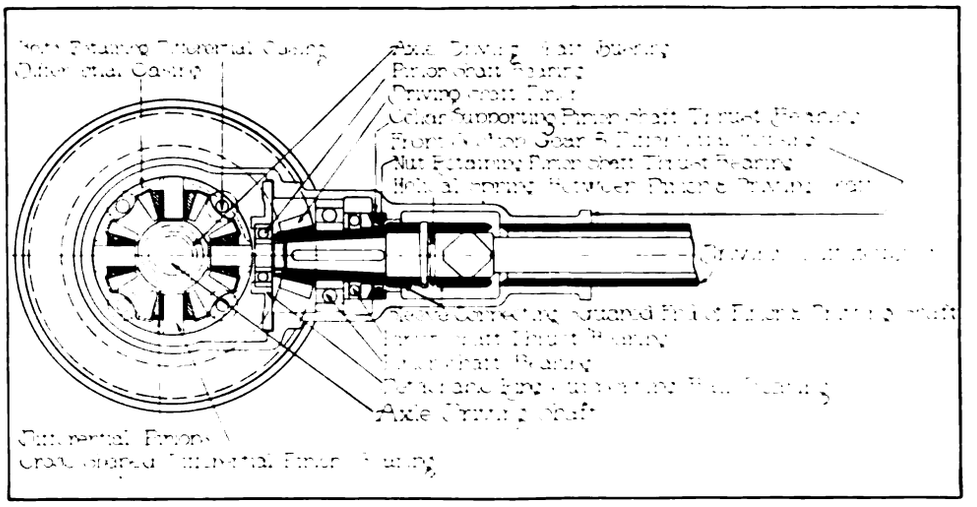
Flywheel and Clutch Assembly.

The flywheel sections are held by bolts so that normally the clutch cone contacts with the internal angular face. The clutch cone is mounted on a sleeve carried on the spigot on which it has a longitudinal movement. On the cone sleeve is a ball bearing for the fork of the clutch lever. This bearing is assembled with a member that carries the three pins of the shaft clutch. As the clutch spring is compressed the clutch is disengaged, it sliding forward on the spigot. As the clutch pedal is released the spring throws the cone backward into contact with the bevelled inner surface of the flywheel. At the rear of the transmission case is the clutch uniting the transmission driving shaft sections, and back of this is the rocking clutch that is carried at the rear of the transmission brake drum, in which is mounted the forward end of the main driving shaft.

This internal cone clutch is designed to be adjusted with a minimum of labor. It is wholly encased with the flywheel in an oil and dust tight compartment and it is free from the usual influences for wear. It is perfectly lubricated and it cannot be subject to the usual causes of clutch trouble. The clutch design is conducive to a minimizing of the oscillatory movement of the crankshaft of the motor and engagement can be made without perceptible jar or jolt.

Clutch Removal Quickly Done.

The clutch may be removed from the case by removing the upper case section, the operation being comparatively easy. By removing the bolts retaining the flywheel sections, the locking spring, the pin and the locking nut and the coupling members of the clutch, and then holding the clutch cone and the spigot in relation by means of a special wrench, the spigot may be backed out of its socket in the end of the crankshaft. This being done the clutch cone, spigot, and the detachable half of the flywheel face may be lifted from the case. This form of construction simplifies any work that may be necessary on the clutch. Every member may be removed and cone refaced or any part restored without affecting the other groups of the assembly. This is a condition that may be well appreciated by those who have to do with automobile maintenance. The lifting of the footboards and the removal of the upper section of the clutch case gives fullest access for any repair, while there is a large handhole for inspection.



Sectional View of the Differential Assembly, Illustrating the Driving and Pinion Shafts Engaging with a Sleeve in Which Either Has Telescopic Action.

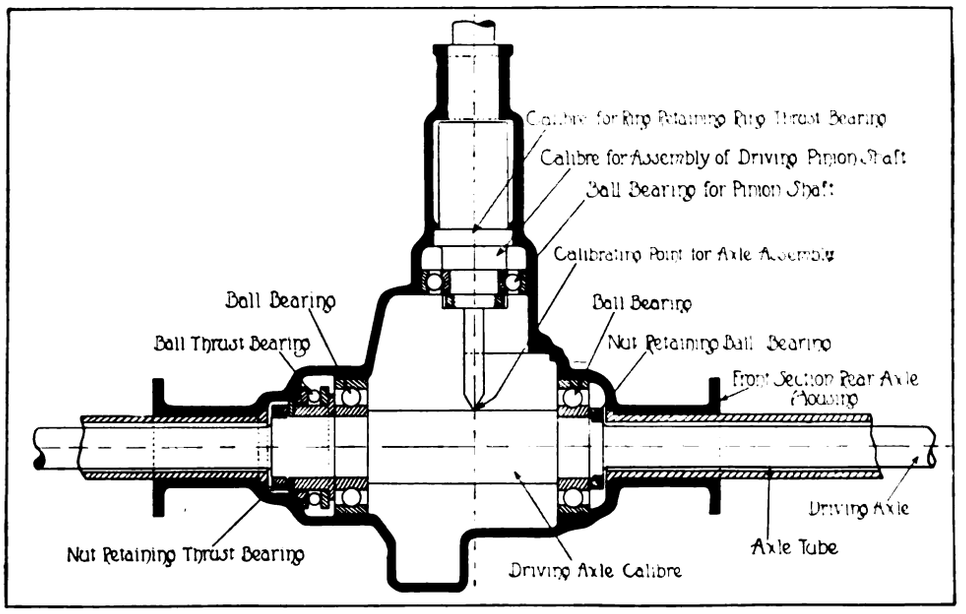
There is conventional construction of the transmission gearset, which has been briefly described. This has the four forward ratios and reverse and the countershaft parallels the main shaft at the side. To secure rigidity of the assembly this end of the case is strengthened by bridging and the overlap of the section joints of the case, which, it will be understood by those who have noted this design, are large and strong. The transmission case is in three parts, the lower, which carries the shafts, gears and bearings, the upper, and the inspection hole cover. That the lubricant with which the case is filled may not enter into the flywheel and the clutch section of the case there is a stuffing box in front of the forward bearing, and a drain from the bearing

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carries all excess grease or oil back into the base of the transmission case.

No Strains from Driving System.

This section of the case is subjected to no driving strains whatever, for the flange supporting the power plant assembly extends from the front to a point midway of the clutch compartment. The clutch lever is mounted at the base of the case and there is no transverse strain from its movement. The transmission brake is similarly operated, but the brake wheel is carried on the shaft directly in front of the double yoke supporting the forward end of the main driving shaft, and the rocking clutch at the rear of this wheel prevents any stress whatever upon the shafts. The arms at the extreme rear end of the assembly carry the brake band for the transmission or service brake. This brake band is of the contracting type with the ends carried on a bar. It is jointed at the centre below the brake wheel and is lined with soft iron. The ends of the brake band are normally kept separated by a spring. At either side of the brake band ends are collars having cams contacting with the band, so that when the supporting bar is turned slightly the cams contact the band tightly about the wheel affording a very efficient brake.



Section View of the Differential Housing, Showing the Method Employed for Calibrating the Gear Assembly to Secure Accuracy and Interchangeability.

Considering this construction for a moment it will be understood that there is no connection of the power plant through brake or clutch levers with the chassis frame. The control levers are mounted on the motor assembly and with the left side drive the driver has right hand levers which are in every way independent of the usual connections. Any twisting stress is avoided and the moving parts are free from influences that might cause excessive wear or friction, while accessibility is always pre-eminent. In fact this characteristic is extended to the cooling system. The radiator is regarded as being especially susceptible to the chassis frame stresses and to protect this the frame in which it is mounted is supported by two ball and socket bearings so that any movement is compensated and the radiator is never strained. The radiator may move independently of the motor because of the flexible connection of the water manifolds, and there is a swivelled rod extending from the dash to the radiator frame to maintain its relation without rigidity.

Three Point Rear Axle Suspension.

The rear construction, comprising the propeller shaft, differential, rear axle, driving shafts, wheels and brakes, has been designed with especial care to meet all of the conditions to which it will be subjected in the usual service of a public cab. There is no part of the mechanism of a chassis on which more time and money is expended than the driving wheels and shafts and it is essential that these be not only enduring but of such form that they can be easily maintained. That the rear axle is oftentimes so expensive is not an occasion for wonder when the heavy work it is constantly subjected to, the design, material and workmanship are considered. Other groups of the assembly are protected by three point suspension, elastic springs and shock absorbers from strains, twists and shocks, but the rear axle is carried directly on the rear wheels and must bear every stress from contact with road obstruction. The greater the speed the more severe the impact. There is absolutely no protection except in reduction of movement, which is precisely what is not wanted by those who desire cab service.

Every detail of design, construction and assembly, as well as the selection of parts and material, must be given the greatest care. The purpose is to obtain what will in every way endure, have ample margin of strength and yet be as light as possible. With only the tires to absorb the shocks it is evident that the one object is to escape every influence for deterioration and weakness. For these reasons I am not favorable to incorporating the speed-changing gear with the rear axle assembly. Not only would this increase the unsprung weight but would also subject this mechanism to greater wear. Besides this the weight is added to by the rods and levers necessary for operation, which must also wear, and there is always more noise as the service of the car is extended.

Advantages of This Design.

The rear axle construction may be likened, indeed, it may be classified, with three point suspension in that two points are supported by the wheels, while the connection of the forward end of the driving shaft may be regarded as the third. It is evident that every advantage should be gained from this so that an easy, rocking or swinging movement of the rear axle should be made possible by the construction and suspension of the shaft. This movement, once provided for, should not be restrained by other parts more than is necessary and consistent with the proper support of the vehicle.

It is necessary to assemble in such a construction, and within the centre of the rear axle, the differential gears, driving and axle gears, the shafts and bearings. To obtain good results the gears must be in perfect mesh and the shafts in perfect line if a quiet, frictionless and economical transmission of power is to be realized.

To accomplish this it is necessary to suspend the centre of the rear axle, where there is always a heavy strain, so as to protect the gears, shafts and bearings from the weight of the vehicle, as well as the other destructive influences. Of these the driving strain of the shaft pinion and the use of the brakes are by no means least. These purposes are best served by the use of a full floating axle, which has been adopted in the design of this cab.

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Full Floating Rear Axle Drive.

By reference to sketch it will be seen that the frame or axle casing carries the full weight of the rear of the car, thus allowing the axles to be assembled at full float. That is, in such manner that they will be only subjected to the turning strains necessary for the transmission of power to the driving wheels, but never to the bending strains which the axles are required to sustain when the driving wheels are attached to their ends. With the semi-floating type the shocks received by the driving wheels are transmitted to the differential drive shaft, gears and bearings, naturally affecting all of them to a greater or less extent. With excessive wear comes greater friction, noise and eventually destruction. A bent axle shaft is not an unusual condition experienced with vehicles of such axle construction.

By further reference to the drawing it will be noted that the housing for the drive shaft is suspended from a point directly above the rocking clutch incorporated with the transmission brake by a double yoke and sleeve that permits the axle housing a free rocking movement in all directions. This suspension point is the transverse bar that parallels the rear sub-frame member. If there be any change of the rear axle with relation to the line of the engine and transmission shafts, the shaft housing always is free and clear of any strains that might bind bearings or gears or cause undue friction. The rocking clutch and the double yoke establishes the entire driving construction back of them to be as another group, practically separate and apart. This design largely eliminates the leverage pressure of the driving shaft and the heavy reactionary pressure on this shaft when the brake is applied. It relieves the shaft from all strains save those necessary for the transmission of power. It will be noted that the driving shaft is really in two sections, the shaft itself and the pinion shaft to which the driving pinion is fixed. The rear end of the driving shaft and the forward end of the pinion shaft are squared and these ends are fitted into a sleeve in which either may move longitudinally, a spring separating them slightly and maintaining a relation so that there is no thrust whatever upon the bevel gear, the pinion, the rocking shaft, transmission brake wheel or the transmission shaft extension. The forward end of the driving shaft in the rocking clutch has a ball head so that there can be no strain upon the bushings. The relation of the rear axle and the frame are maintained by two radius rods or shove bars having ball and socket connections at the axle which do not restrain the movement of the axle in any other direction. These rods relieve the springs from the strains of propelling the car and prevent a swinging motion of the body on rough roads.

Axle Housing in Four Sections.

The rear axle housing is in four sections, these being the central section which contains the differential and the bevel gear, divided vertically on a line paralleling the axle, and the two end members. Referring to sketch it will be noted that the axle sections are bolted together by flanges well outside the centre line of the differential. The ends of the end sections of the housing carry the heavy flanges on which are installed the shoes and the rods actuating the internal expanding brake. Through the axle housing from either end to the differential bearings extend heavy steel tubes which reinforce the construction and project beyond the flanges at the housing ends. On the ends of this tubing are the double ball bearings on which the wheels are mounted. The design is such that the axle housing joints will sustain many times the weight or strain they have to bear without being deflected from the true lines.

The differential assembly consists of four pinions and two gears, the whole carrying the bevel or driving gear of the rear axle. The driving gear is at the left side. At this side is both a ball thrust and a ball bearing, and at the right is a ball bearing, on which the differential assembly revolves. The axle driving shafts at the outer ends are fitted with clutch plates which mesh with clutch rings fixed at the outside of the hubs of the rear wheels so that the wheels are constantly retained. The leverage pressure upon the driving and pinion shafts is eliminated by the two ball bearings to be noted, the one in front of the pinion gear on a detachable ring and the other just behind this gear, supported by the driving shaft extension of the axle casing.

Ball Bearings for Moving Members.

Throughout the rear axle construction five ball bearings are used and there are two ball bearings in each of the wheel hubs, set well apart to secure steadiness and smoothness of wheel movement. The shafts and gears of the driving system are made from chrome nickel steel, this insuring the greatest strength and lightness. The driving shaft is suspended in the chassis so that when the vehicle is loaded the drive is practically in a straight line, this permitting the utilization of nearly all the power developed by the motor. The driving and axle shafts and the differential are operated in an oil bath, which affords the fullest quality of lubricity.

It is well known that with the full floating type of axle construction the application of a balanced brake does not load or strain the shafts and gears. In fact such brake gives the best service and is the most economical in its wear upon the transmission system. It is for this reason that I have designed the wheel brake for constant service, to be operated by the pedal, and the emergency brake on the transmission to be actuated by the hand lever. The importance of this assembly is not to be under-estimated, for the pedal is the quickest to operate, is the most convenient and will be used by the driver in practically every case in preference to the hand lever.

It will be seen by observation of the details described that the power plant and driving mechanism of the cab have been designed with the purpose to escape so far as this is possible all conditions that may cause unnecessary wear and deterioration. The assemblies have been made oil tight and dust proof and protected against all accumulations of abrasive substances. The flexibility of the constructions throughout has been sought with a view to insure against every condition that might cause wear The lubrication has been studied with a knowledge of the need of a sufficient supply at all times. The utilization of the power has been made with the smallest motor that would serve all requirements. The materials chosen have been the best and the workmanship necessary in the production of the parts is to secure standardization and interchangeability. The mechanism may be inspected, adjusted and restored with the least labor and consequently little loss of time and service. The cab is intended for long and continuous work that may be required under average conditions, and because of undoubted economy from the viewpoint of the operating company and the satisfaction to be obtained by the patrons, the design appears to the writer to have much to recommend it.

TURNTABLE MEETS WITH FAVOR.

Turntables are invaluable in garages, and the Portland Garage Company, Portland, Me., which produces these devices is the recipient of many testimonials from leading garages and factory branches praising its appliance. The company constructed a special table for a manufacturer who exhibited at the New York and other shows.

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TO TEST SAMPSON ARMY WAGON.

Although it has been stated that the government intends to replace the army mule with the automobile, nothing has been done as yet in an official nature toward buying or ordering in large quantities.

The purchasing thus far has been confined to a few cars, and these have been ordered by the quartermaster's department. One of these contracts was placed with the Alden Sampson Manufacturing Company, Detroit, a constituent of the United States Motor Company, New York City, and the machine which is depicted in the accompanying illustration, was built under special requirements and specifications furnished by the government.

From the standpoint of army practise in field equipment, this truck is not unusual although its features are interesting in that they differ from what is standard practise with makers of commercial vehicles. For example, the wheels of the Sampson are 42 inches in diameter, both front and rear, this size being necessary to give the clearance required in cross country work.

As the mule drawn equipment has to ford streams, travel through open fields and run over stones, etc., the government requires that the successor to the old method shall be equipped to do this work. To haul the car out of mud holes or places where traction cannot be secured, the wheels are constructed so that winch heads may be attached by means of simple hook bolts. The rope is fastened to some fixed object and a few turns taken around the winch heads. The slipping of the wheels winds the ropes, drawing the car from its position. The driving chains are enclosed in sheet metal casings, these serving to keep out the dirt and mud as well as distance and torque rods.



Sampson Army Power Wagon Constructed for Quartermaster's Department, Which Is Undergoing Trial in Texas.

The seat is built over the engine, a practise characteristic of the Sampson 3000-pound capacity wagon. The inside body dimensions are nine feet by 43 inches wide. It is equipped with flare boards on side and a tail gate of height equal to that of the side members. These are heavily reinforced with iron and chained. Conforming to army practise the carrying receptacle is fitted with removable bows and a canvas covering.

It is interesting to note that the government specifies a maximum speed of nine miles an hour. The normal speed of the motor is 1000 revolutions a minute and the engine is restricted by a governor. A specially low gear is fitted. Another notable feature is the tread. This is 60 inches which suggests that a wide range of service is anticipated. The wheelbase is 110 inches and the vehicle is designed to carry a load from 2500 to 3000 pounds.

The motor is a four-cycle, four-cylinder, water-cooled unit, having a four-inch bore and five-inch stroke. It is mounted on a pressed steel frame, 4.5 inches deep, and the flanges are tapered from four inches wide in the centre to two inches at the ends. The front axle is a standard forged I beam section steel member while the rear is 2.5 inches square with hubs having roller bearings. A multiple disc clutch and a three speed transmission is fitted, and a double set of brakes, these being of the internal expanding type and practically self wrapping in either direction. The automobile was sent to the Mexican border recently.

MOTOR TRUCK STANDARDIZATION.

At a recent meeting of the special committee appointed by the Society of Automobile Engineers to consider the course of action to pursue in furthering the work of standardizing mechanical transports it was decided that it was desirable to attempt to standardize the sizes and capacities of trucks from the purchaser's or user's standpoint, and afterwards to extend the work in the direction of aiding the manufacturers in standardizing design.

The next proceeding was to determine the specification of normal load and the overload of machines from one to five tons and it was generally decided to vote that each car should be capable of rendering normal or continuous service under its tonnage rating and have an overload capacity for temporary or emergency service of 25 per cent. of its normal tonnage capacity.

Next an attempt was made to determine the desirable speeds for various sizes and by a process of voting the following was arrived at: For one-ton trucks, 15 miles an hour; two-ton, 12; three-ton, 10; four-ton, nine; five-ton, eight. These determinations may be modified later, however.

Considerable discussion took place as to what the determining factors for capacity should be and it was agreed that the committee would take under consideration in this connection horsepower expressed in the dimensions and speed of the motor, as well as in draw bar pull of the truck in completed condition.

It was determined that the committee should write to the manufacturers of axles for both motor trucks and horse vehicles and enquire their present practise insofar as dimensions relate to load carrying capacity. It was also determined to secure the specifications of machines now manufactured and at a little later date request the recommendations of manufacturers as to what their judgment would be in the matter of critical specifications on various truck sizes insofar as they relate to axles and their essential elements.

This subject is one which has an interest for manufacturer and user alike, in that with proper standardization the purchaser will be able to judge better the respective merits of the machines offered for his inspection.

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FOREIGN TRUCK NOTES OF INTEREST

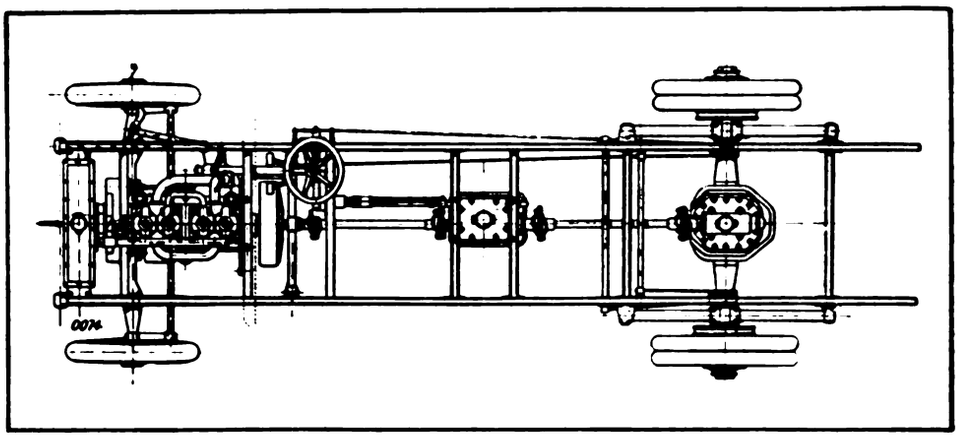
KNIGHT ENGINE FOR DAIMLER TRUCKS.

While the Knight sleeve engine has been used with splendid success in a number of pleasure cars abroad and in this country, it has made little progress in the commercial vehicle field. The first models thus equipped are announced from the factory of the Daimler Company, Ltd., Coventry, England, these comprising: One-ton delivery wagon, two and three-ton trucks, 40 horsepower omnibus, five-ton truck and 100 horsepower agricultural tractor. In addition to the Knight engine these cars are fitted with the worm drive.

The motor in the one-ton vehicle has a bore of 90 mm and stroke of 110 mm, and is rated at 27 horsepower at 1200 revolutions. The cylinders are cast in pairs. Lubrication is by plunger pump, which delivers oil to troughs beneath the connecting rod big ends. Ignition is by Bosch high-tension magneto, as is true of all the models. A leather faced cone clutch is employed. The transmission is of the selective sliding gear type, giving three speeds forward and reverse.

The worm and worm wheel are carried inside a cast steel housing to which are attached the hollow forged flanged steel axle tubes. A large cover is fitted over the top, and this supports the worm and wheel as well as the differential gear. It is possible, by removing this cover, to take out the whole of the gearing.

Two sets of brakes are provided, both acting on the rear wheel drums. The frame is of ash, reinforced by nickel steel plates, and the cross members are of similar construction. The wheels are hollow steel castings, mounted on ball bearings.



General Arrangement of the New English Daimler Truck Chassis, Equipped with Knight Sleeve Valve Motor and Worm Drive.

The same description will apply to the two-ton model. The three and five-ton vehicles and omnibus are fitted with an engine of 40 horsepower, the bore being 110 mm and the stroke 150.

The tractor's motor has a bore and stroke of 150 mm, which is started by a three horsepower air-cooled engine, located on the footboard beside the driver. This auxiliary motor drives a belt attached to a pulley on the rear end of a shaft which runs forward to a small disc wheel, engaging with a groove on the flywheel of the main power plant. The worm, which is of ample proportions, is located directly over the axle, and the drive is taken from its cross shaft by means of pinions, which are located vertically over the final spur rings bolted to the road wheels, the latter being standardized at eight feet in diameter. It is claimed for this tractor that it can pull 14 to 21 disc plows, cutting a furrow up to eight inches in depth. Actual tests are said to have demonstrated that it can turn over 3.75 acres an hour on a gasoline consumption of 11 pints an acre.

STREET CLEANING IN PARIS.

The municipality of Paris, France, is experimenting with four types of motor driven street cleaning machines. These include a straight sweeper, sweeper with spraying jet to prevent dust, combined sweeper and watering cart and watering carts with large capacity for washing streets.

The first named types are supplied by Louis Renault and Sautter-Harle & Co. The former maker utilizes the standard twin-cylinder motor of 80 mm bore and 120 mm stroke as employed on taxicabs. The Sautter-Harle machine is driven by an engine having 90 mm bore and 140 mm stroke. With the latter the brush is driven by means of side chains, operated from a countershaft engaging with a pinion within the differential housing. On being raised the brush is declutched automatically, and provision also is made for regulating its height as wear of the bristles takes place.

The sweeper and sprinkler is furnished by the De Dion-Bouton Company, and is distinctive by reason of the fact that the brush is located under the centre of the vehicle. The fan-shaped sprinkler is just ahead of the brush. The combined sweeper and watering cart is produced by the Laffly concern. A 77-gallon water tank permits the street to be thoroughly watered before the brush rolls over it. Still another combination vehicle is the front driven Latil, which is equipped to flush the street with water for washing immediately after the brush has passed over it. Two water pumps of low capacity are utilized for watering only, while a third with much larger capacity is used for washing.

POSSIBILITIES IN MALAY PENINSULA.

Good opportunities for establishing motor truck lines, possibly with a tractor and trailer combination, are said to be found in the Federated Malay States. One instance is cited in the vicinity of Kaula Lumpur, the centre of the planting country. The 30 miles of road between that town and Port Swettenham is in excellent condition and taps the fertile valley of the Klang. The present railway line is said to offer very unsatisfactory service, and the growth of the export business through Port Swettenham has been such as to compel the producers to seek some means of relief. Motor trucks would be able to cover the distance in a few hours.

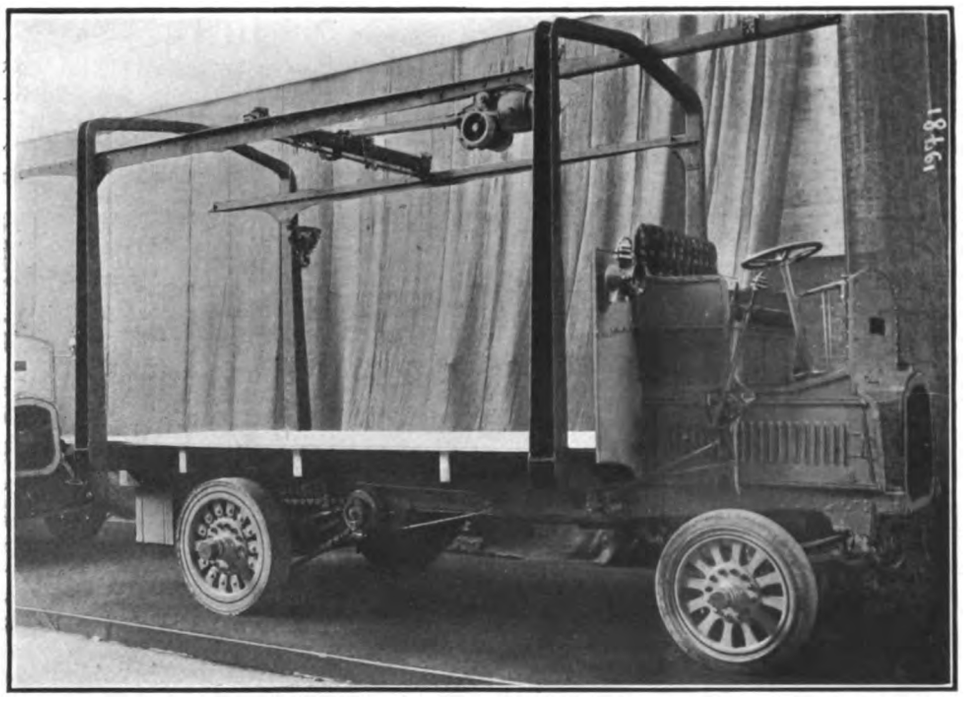
The same thing holds true in Singapore, where the

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transportation of goods from the wharves to the business houses is in the hands of two companies, one of which has begun the use of motor vehicles and with excellent success. Among the more recent ventures may be mentioned the establishment of a motor passenger and freight service between Kuching and several of the adjacent towns. A two-ton truck has been ordered from England, the promotor being Tan Boon Siew, manager of a local Chinese firm.

MODELS PRESENTED AT BRUSSELS SHOW.

Inasmuch as there has been a decidedly increased interest in commercial vehicles in Belgium, following important improvement in the highways subsequent to the international road congress of 1909, it is anticipated that this country will offer a splendid market for industrial transports during the coming year. The recent automobile and aerial craft exhibit in Brussels, demonstrated that local capital is taking advantage of the outlook, as no less than four new Belgian motor truck manufacturers were represented with vehicles of various capacities.



Delahaye Five-Ton Brewery Vehicle, Fitted with Electric Hoisting and Travelling Device Displayed at Recent Brussels Show.

Albert Bory of Brussels, regarded as the first commercial vehicle constructor in Belgium, presented a 3.5-ton chassis, which has been adopted by the Belgian army, and two light delivery wagons. Robinson & Co. of Antwerp showed a new electric vehicle, in which each front wheel is driven by a five horsepower motor. The Auto-Mixte Company of Liege displayed a tractor and trailer, comprising a six-wheeled train, in the rear compartment of which a flying machine was packed away as if ready for shipment. The Preudh'homme-Prion Works of Huy exhibited a six-ton truck, a duplicate of those ordered from this concern for the Russian government.

Among the more important exhibits of older firms was that of the Delahaye, which was represented by 3.5 and five-ton models. The first was of the subvention type, with 24 horsepower motor of 80 mm bore and 140 mm stroke. The five-ton vehicle was designed for brewer's use, although of course it might be employed similarly in other lines. The engine is rated at 32 horsepower, having a bore of 100 mm and stroke of 160 mm. The driving wheels are fitted with solid tires, in which steel studs are imbedded. The distinguishing feature is the electric hoisting and travelling gear, supplied with power from a small dynamo driven from the engine. The accompanying illustration brings out this feature.

SCOTLAND'S COMMERCIAL CAR EXHIBIT.

The annual show of the Scottish Automobile Club, which was held this year in Glasgow instead of Edinburgh, did not reveal any large number of new features, having in mind the display at the Olympia show earlier in the season. Some very splendid body designs were shown, particularly with respect to so-called municipal service wagons and ambulances. In the matter of construction, the worm drive appears to have been extended slightly.

Only one American car was seen, the White, made by the White Company, Cleveland, O. This was shown in the three and five-ton sizes. One other model is of special interest to Americans, inasmuch as it is made under license in this country. This is the Commer, which was shown by Commercial Cars, Ltd. It displayed the three and five-ton trucks, ambulance and two 'buses. One of the latter was fitted with a worm drive.

The Dennis concern, which supplies a large number of British cities with their fire apparatus, showed a new gasoline driven pumping engine, capable of throwing 500 gallons of water a minute. This company also displayed a three-ton vehicle fitted with a worm drive and other features characteristic of the Dennis make.

One of the most interesting exhibits was that of D. Stewart & Co., with the Stewart-Thornycroft steam vehicle rated at five tons. No change was noted in the boiler equipment, but the road wheels are now of the Reid-Rieke spring patent. These latter are of steel. Between the steel felloe and the outside steel tire are located some 25 coiled springs, so disposed as to take up all road shocks. The wheel has been given a number of satisfactory tests and is held to be thoroughly practical.

GRAMM TRUCKS IN RUSSIA.

What is claimed to be the first American truck purchased by the Russian government is a Gramm, made by the Gramm Motor Car Company, Lima, O. The vehicle was shipped to St. Petersburg last September for demonstration purposes, and has been in the service of the War Department for the past two months without repairs.

MOTOR TRANSPORTS IN SOUTH AFRICA.

Recent advices from Cape Town in South Africa indicate that there is to be a large increase in the number of motor trucks in use in that section during the coming season. While many of the country roads are not especially good, it is understood that considerable improvement has been made in the Transvaal, and that merchants in Johannesburg and Pretoria are in the market for many cars.

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FIRE DEPARTMENT NOTES

During a recent big fire in Richmond, Va., the superiority of the modern fire equipment was demonstrated in a striking manner. Recently, Chief Joynes placed in service a Knox pumping engine, made by the Knox Automobile Company, Springfield, Mass. For 13 hours this machine kept two streams of water going on the fire, practically without intermission, and within a few minutes after it returned to headquarters it was ready for another call.

The alarm was rung in shortly before 6 in the evening, and it was not until 7 the next morning that the recall was sounded. During all this time the chauffeur, who also acts as engineer and mechanician, occasionally poured a bucket of gasoline into the tank and went over the mechanism with an oil can.

The steam fire engines at work during the same period each required two men, an engineer and a fireman. Their total consumption of fuel is said to have been over 25 tons of steam coal. The bill for running the gasoline pumping engine at full speed for the 13 hours was just $4.50.

This big Knox engine really is an entire fire department in itself. It is propelled by the same motor that works the pumps, a six-cylinder, 60 horsepower unit. It also carries a 35-gallon chemical tank with hose and 1000 feet of water hose. When not in action it has no horses to feed and its cost of maintenance between fires is practically nothing. In addition, it may be stated that it does not require horse wagons to supply it constantly with fuel when working at fires.

An accompanying illustration presents a hook and ladder truck recently supplied to the fire department in Indianapolis, Ind., by the Mais Motor Truck Company of that city. A particular feature of the equipment is the tires, said to be the largest ever manufactured. These are 38 by eight inches in size and made by the United States Tire Company, New York City, upon special order for the Mais concern.

The vehicle was placed in such service that it was essential to have more than ordinary speed possibilities, even for this work, and the truck was designed to obtain 40 to 50 miles an hour without difficulty. In order to accomplish this, the weight is carried very low, and while there are nearly 400 feet of ladders on the wagon, they are nested so closely together that the highest point of the equipment does not measure more than five feet from the ground.

The city of Paterson, N. J., has been progressive enough to purchase two motor driven chemical engines, and these have just been placed in service. The vehicles were made by the Alden Sampson Manufacturing Company, Detroit, a constituent of the United States Motor Company, which placed the order. All of the paraphernalia which is a part of the chemical equipment has been placed in a convenient manner on these trucks, so that quick action is possible when it is necessary for the vehicles to arrive at the scene of the fire.

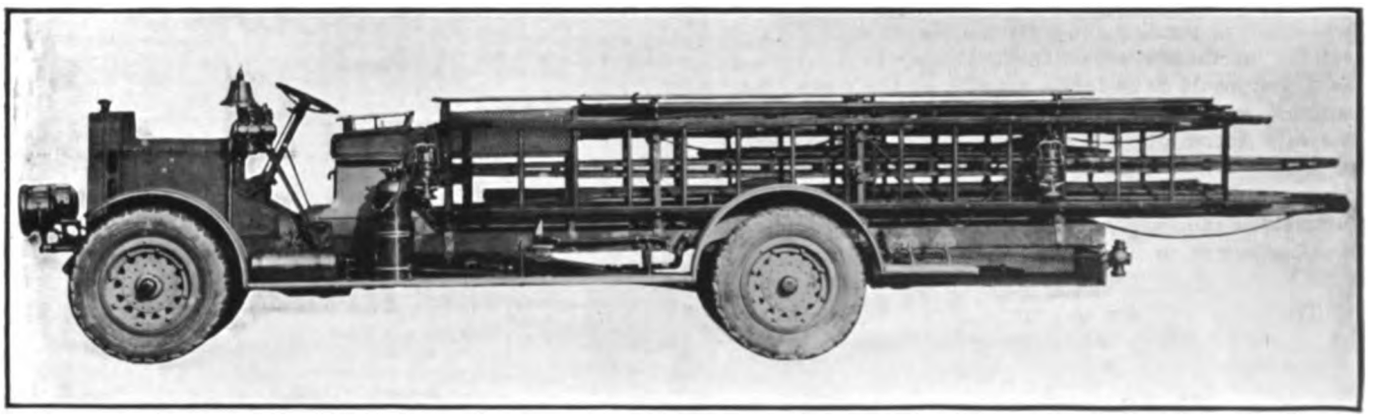
Alderman James L. Harrop of Worcester, Mass., chairman of the joint standing committee on fire department of the city council, has been in conference with Mayor David F. O'Connell, relative to the purchase of additional motor driven fire fighting apparatus. The mayor is very much in favor of automobile equipment, and took the matter up exhaustively in his inaugural message. The plan contemplates the replacement of horse drawn combination chemical and hose wagons at two stations with the modern equipment.

J. W. Cristie, who is more or less well known in the industry because of his advocacy of the front drive, has brought out a two-wheeled tractor embodying features of this design, for use in hauling steam fire engines. The new vehicle was demonstrated recently in Washington, D. C., Hoboken and Paterson, N. J., and New York City, by C. J. Cross of C. J. Cross & Co., who it is understood will market the product.

A special committee on better protection of property, appointed by the town of Wakefield, Mass., will place an order in the immediate future for a motor driven combination chemical and hose wagon. The committee has $5800 at its disposal.

Many southern cities have been adopting motor driven fire apparatus, to the total exclusion of the horse drawn equipment within the past year. Macon, Ga., is one of the municipalities which gave the plan a trial about a year ago. The remarkable success resulting is best exemplified by the following resolution recently passed by the city council:

"Whereas, the auto apparatus now in use in the fire department has clearly demonstrated its advantages over the horse drawn apparatus, from the viewpoint of lessening expense of maintenance and increase in efficiency, and the use of much less apparatus is approved by the Southwestern Tariff Association; and



Hook and Ladder on Mais Chassis, in Use by the City of Indianapolis, Ind.—Note Tires, Said to be Largest Ever Made.

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"Whereas, the committee on fire department, after careful investigation, is convinced that the city can effect a further saving from $800 to $900 a year by supplanting the horse drawn apparatus with the motor driven apparatus, besides greatly increasing the efficiency of the department; therefore, be it

"Resolved, That the committee on fire department be, and it is hereby, authorized to begin negotiations at once for the purchase of two auto fire engines and one auto truck, the same to complete the equipment of the department."

Commenting editorially on the subject of securing new fire fighting equipment, the Waterbury American, Waterbury, Conn., has the following to say:

"Here is the point for the consideration of the good citizens of the Walnut street district who seem to prefer a poorly equipped fire house in their own immediate territory to the equipment of existing houses with modern automobile apparatus. On an alarm from the West End today the new automobile engine from the East End reached the scene ahead of the horse drawn apparatus from Scoville street and from the head of Willow street, though it travelled considerably more than twice as far. In other words, the equipping of a house in the East End has improved the West End's fire protection as much as would the establishment of horse drawn apparatus, say in the vicinity of the Green.

"The money required for a new house on Walnut street would furnish three or four pieces of automobile apparatus, and these placed in the Baldwin street, Willow street, Brooklyn and possibly the Burton street houses would protect the northeastern section far better than any equipment they could hope for in a house of their own, besides being of incalculably greater value to the rest of the city. The substitution of an automobile for horses has the effect of moving a fire station at least half and probably two-thirds nearer any given point. With the introduction of automobiles the advantages of having a fire house next door have become more sentimental than real."



Combination Hose and Ladder Wagon Furnished to City of Tupelo, Miss., by Federal Motor Truck Company.

The following cities and towns have appropriated money for or are considering the purchase of automobile fire apparatus: Rochester, Minn.; Shawnee, Okla.; Moline, Ill.; Petaluma, Cal.; Reading, Penn.; Quincy, Ill.; Atlantic City, N. J.; Chelsea, Mass.; Marblehead, Mass.; Southington, Conn.; Watervliet, N. Y.; Bakersfield, Cal.; Johnstown, Penn.; Sandusky, O.; Syracuse, N. Y.; Middleboro, Mass.; Decatur, Ia.; Arlington, Mass.; Brockton, Mass.; Jackson, Miss.; Pittsburg, Penn.; Morristown, N. J.; Hartford, Conn.; Rochester, N. Y.; Somerville, Mass.; Detroit, Mich.; Rock Island, Ill.; West Springfield, Mass.; Rockland, Mass.; Cohoes, N. Y.; Ottawa, Can.; Oklahoma City, Okla.; Binghamton, N. Y.; Macon, Ga.; Lakewood, O.; Manchester, N. H.; Richmond, Va.

At the annual meeting of the town of St. Johnsbury, Vt., an appropriation of $7500 was made for the improvement of the fire department. This led to the purchase of an automobile truck and chemical engine.

Herewith is presented an illustration of the combination hose and ladder wagon constructed for the city of Tupelo, Miss., by the Federal Motor Truck Company, Detroit, about six months ago. This concern furnished the vehicle and equipment complete, with the exception of the ladders. The department in Tupelo reports that it has been doing most satisfactory work.

The chassis is exactly the same as that utilized in the Federal one-ton truck. The four-cylinder motor has a bore of 4.25 inches and stroke of 4.5, and develops 30 horsepower at 1000 revolutions. The cylinders are cast in pairs and are of the L head type, with both inlet and exhaust valves, which are interchangeable, on the right. Cooling is by water, circulated by gear driven centrifugal pump. Lubrication is by splash, and ignition by high-tension magneto, with set spark.

The clutch is a leather faced cone, and is supplied with six auxiliary springs which provide very easy engagement. The transmission and jackshaft unit is so mounted that it can be removed without disturbing any other part, or the transmission alone can be taken out without disturbing the jackshaft. This accessibility of parts is a decidedly important feature in the construction of this truck.

A newspaper in Baker, Ore., held a popular voting contest recently the prize for which was an automobile. It was won by the fire department, which will have the machine fitted with chemical tanks and apparatus for the use of the chief.

REO SAVES MORE THAN COST.

One of the many instances of how the commercial vehicle effects economy is noted in the case of a Reo light delivery vehicle sold some six months ago by R. E. Ingersoll, metropolitan sales manager for R. M. Owen & Co., distributor for the Reo Motor Truck Company, Lansing, Mich. During six months the car covered 4553 miles, making 3773 stops and the cost for gasoline, oil and repairs was $78.86, an average cost of less than 1.75 cents a mile. During its service the automobile has earned $900.54, or $150 more than its original cost. The machine was operated during the severe snowstorms and under conditions when the horse drawn equipment was seriously handicapped.

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The MOTOR TRUCK
Devoted to Motor Driven Business Vehicles of All Classes.

VOL. III. PAWTUCKET, R. I., APRIL, 1912 No. 4

BOSTON SHOW BOOMS WORLD'S BEST MARKET.

New Trucks and Wagons Develop Much Interest---Many Agencies Made and Individual Sales Far Exceed Expectations---Public Accepts Results of Haulage Inquiries and Changes Methods to Adopt Power Service.

REGARDED from any point of view, the exhibition of power wagons made by the Boston Commercial Motor Vehicle Association, which was concluded March 20, was the largest and most productive ever held in America. It was the first show at Boston devoted exclusively to service wagons and its success was such as to justify the statement that in future these expositions will be the most important of the year. This statement is made advisedly and with a realization of the full value of the show to the people as a whole. It is not based on the desire of the industry or the trade, but upon the demand of the whole people for education in a subject that means more to them than any other. The service wagon is regarded primarily as being a means for economy in industry and commerce. As such it has been exploited and its utility developed. But its usefulness may be applied to every form of transportation. Through its use the business man may extend his activities, affording to the public the advantages obtaining from the larger and carefully organized enterprises. The cost of transportation may be said to be equal that of production. This may be the better realized from the enormous development of railroads and other means of public service. The United States is a nation of magnificent distances and each mile between communities has a distinct commercial value. There has been but little attention directed toward distribution with a view of economizing selling values. Production is seldom near the supply of raw material. There has been some consideration of this phase in metal producing and in textiles, but establishing the market cost has never been with reference to supplying the people at the lowest price that could be consistently charged. Competition has invariably dictated prices, if the market be uncontrolled.



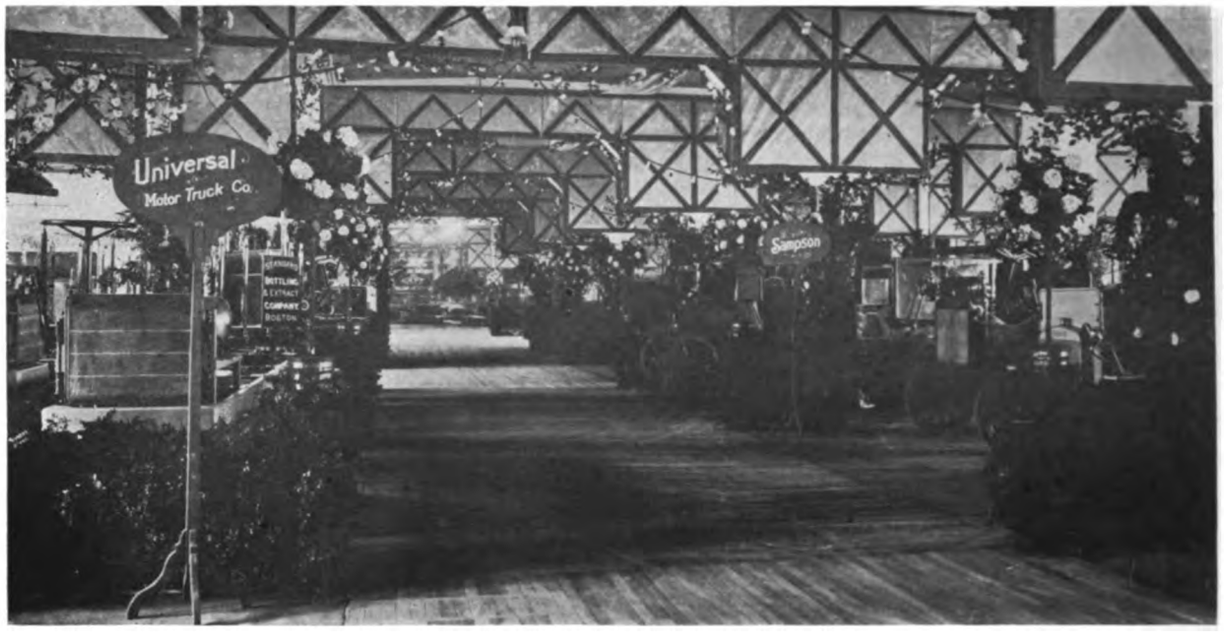
Looking Across Grand Hall from the Balcony, Showing the Power Wagon Display in Decorations Representing a Spanish Mission Scene.

It is entirely practicable that business development should influence the market. It is also a fact that activity should correspondingly affect it. That is to say, that it is possible through a lessened cost of transportation and delivery to make lessened prices, this being the logical manner of obtaining public patronage. This reduction of haulage may be accomplished by the power vehicle by performing a given service with less expense as compared with animal transport; by doing more work for no greater expenditure; by doing more work at no greater proportionate expense; by doing more work at less cost.

These facts are realized by the people who have given the subject of haulage serious consideration. The possibilities for business have been deliberated and established. With animal transportation the limitations were understood. Beyond them no one cared to venture. Some large enterprises have undertaken to extend their markets but the cost is necessarily much larger and the service has been given at what might be regarded as a loss. But with the knowledge that the service vehicle is in every way dependable and economical the business men have found themselves facing what is no less than a revolution in methods. During the period since the practicality of motor conveyances was established there has been conviction that eventually the mechanical vehicle would be generally, if not universally, adopted for all purposes save construction within the natural limitations. The barrier has been ignorance of the actual cost of animal service and inexperience with that afforded by motor driven transports.

The point has now been reached when the value of the service wagon has been established. Its utility is acknowledged and its economy is not questioned. It is no longer an experiment. But there is realization that it is imperative

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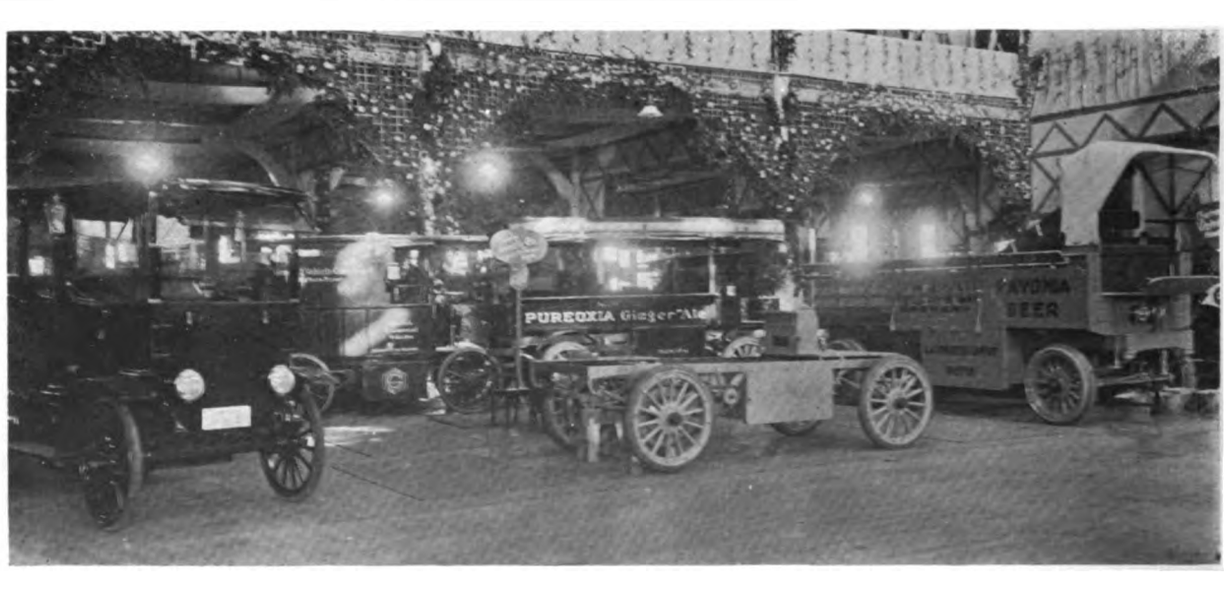


Looking Down a Long Aisle in Machinery Hall with Its Decorations Suggesting an Old English Rose Garden in the Early Spring.

to change the methods of delivery and distribution to obtain the fullest benefits of the improved service. The concentration of the attention of the business man has in the past been on his own affairs. He has met the problems as they have appeared and worked out solutions to best serve his purposes. He has been entirely satisfied with his results. While apparently similar, it is found upon analysis that there are conditions entirely different with two concerns engaged in the same business.

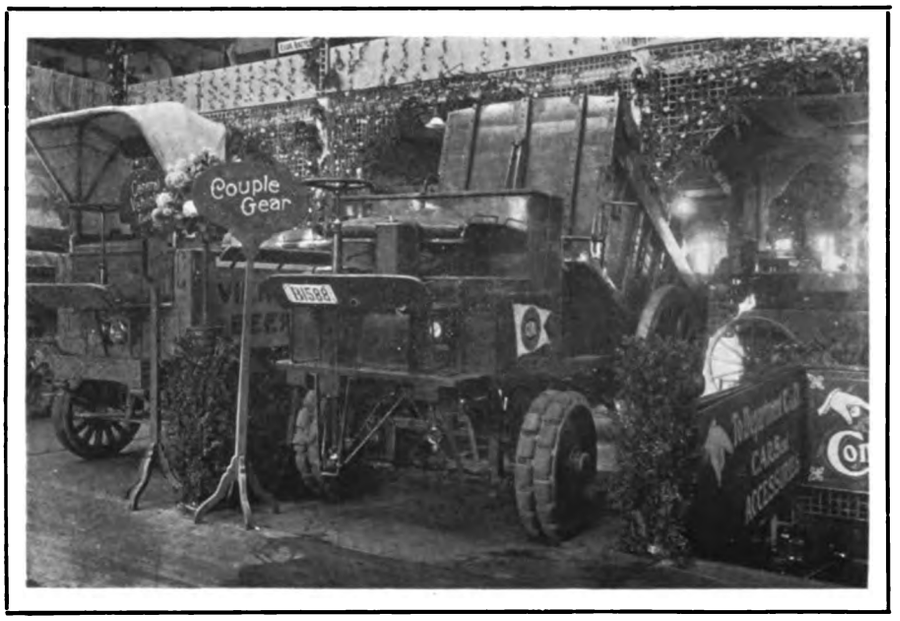
The manufacturer of service vehicles has been compelled to educate the people to the actual business necessities and requirements. He has been forced to begin with his selling agents and impress upon them the possibilities for mechanical transport service. Then in turn it has been necessary to deal with all business interests to demonstrate the practicality of the conveyances. Next it has been found imperative to study each individual need and to work out solutions that are so thoroughly practical and convincing that the service vehicle has been adopted. Conditions have been normal and logical aside from the fact that the business man had not been willing to apply to his own use information that had been worked out by those who had studied the subject because, in his opinion, he was not satisfied that what obtained with others did obtain with himself. He has been willing to accept every other business principle without question and has been guided by custom and precedent, but in that concerning which he should be the best informed he has been absolutely ignorant.

The organization of the service wagon show at Boston has been extremely beneficial to the business interests in that the vehicles, always shown heretofore as secondary to pleasure automobiles, have been given the prominence they should have and the exhibition has made possible the showing of a much larger number of makes, and of each type. This has resulted in first stimulating interest in the machines themselves, as there is competition in the exhibits in everything save service. This interest has impelled consideration of the different types in each class, and the



A Glance Into the Stand of the General Vehicle Company, Showing a Special Ambulance, Delivery Wagons, a Brewery Truck and a Chassis.

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Democratic Vehicles, Couple-Gear Gravel Cart and a General Vehicle Brewery Wagon, Amid the Hedges and Climbing Roses.

adaptation of these machines to differing service. To make clearer the result it may be said that study of a condition may establish that a specified work may be done more economically and satisfactorily with another size or type of machine than was contemplated.

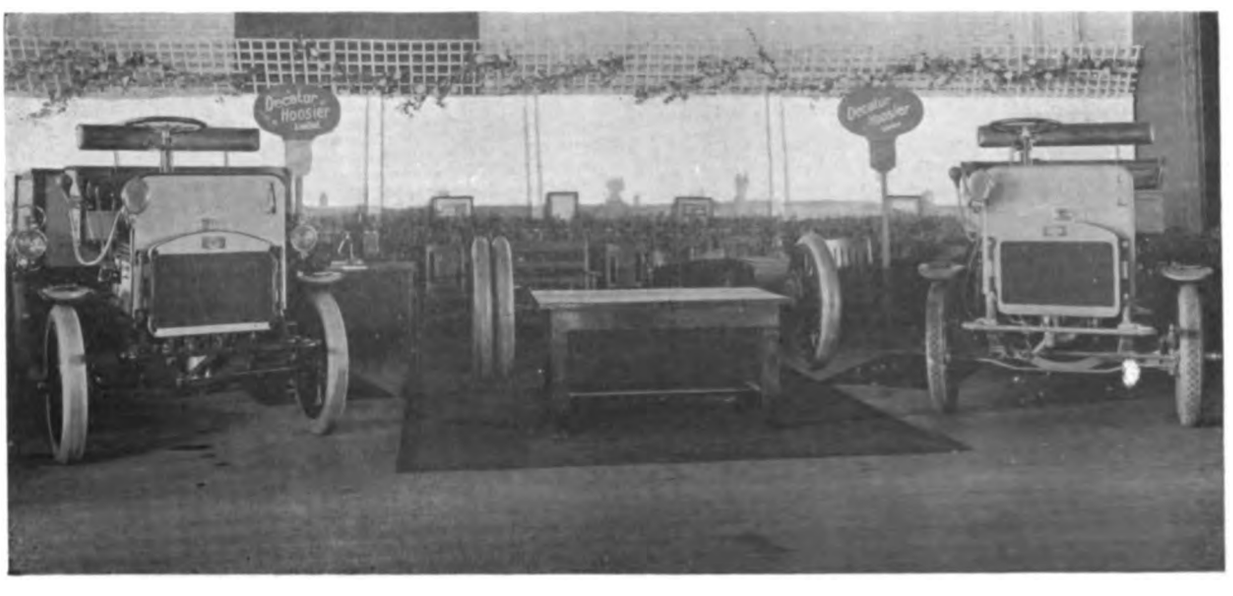
But the main value to the industry and the trade is in the fact that those who visited the exhibition have a sufficient concern to consider service wagon use and to take up the study of utilization. The importance of this to the manufacturer and the distributor is manifest. It has placed the industry on the same commercial basis that may obtain with any other. It has convinced the man of business that it is absolutely necessary for him to devote his attention and endeavors toward what has been neglected, and which must be improved to the fullest extent.

Largest Motor Truck Show.

The Boston service wagon show was the largest exhibition of these vehicles ever held under one roof. This fact means more than may appear without reflection, for not only were all vehicles so displayed that comparison could be readily made, but there was certainty that all received the same attention. There is no question that it would be far better from the viewpoint of the visitor were the machines shown in classes and each class separated, departmentalizing by character and capacity of vehicle, but this is not possible under the system where there is a choice for space in the entire show. Were the exhibitors limited in their space selection to any given department this would seemingly eliminate a condition that was found to be decidedly unsatisfactory from the standpoint of the man who desired to see all of a certain class of machines and was compelled to search through the entire exhibition, with no assurance that he had found all that might interest him.

In addition to this there was a material delay of some of the exhibits, which was a distinct loss to the disappointed exhibitors, for in at least one instance a machine, and the only one of the make shown, was not received in the show until the last day. Others, for which space was engaged, did not arrive. One reason was the endeavor of some of the manufacturers to make display at other shows, suffering transportation delays that were of such a nature that only by allowing the greatest margin could the machines have been received for the opening. It is obvious that to take any chance that would curtail or prevent display at so important an exposition was ill advised. It is quite as evident that competition demands that every opportunity to obtain publicity should be accepted. To make exhibition after announcement of such showing is a duty that should be fulfilled, for the people who may have been attracted by that particular exhibit ought to be considered.

The number of complete wagons shown was 182, and the chassis numbered 42, this making a total of 224. In all 61 different makes were represented. The number engaging space for vehicle exhibition and entitled to representation was 64. It will be seen that average number of vehicles to exhibitors was approximately 3.66, but as a matter of fact six exhibits constituted about 33 per cent. of



Where the Decatur "Hoosier Limited" Was Displayed, the Exhibit Consisting of a Complete Vehicle and a Chassis.

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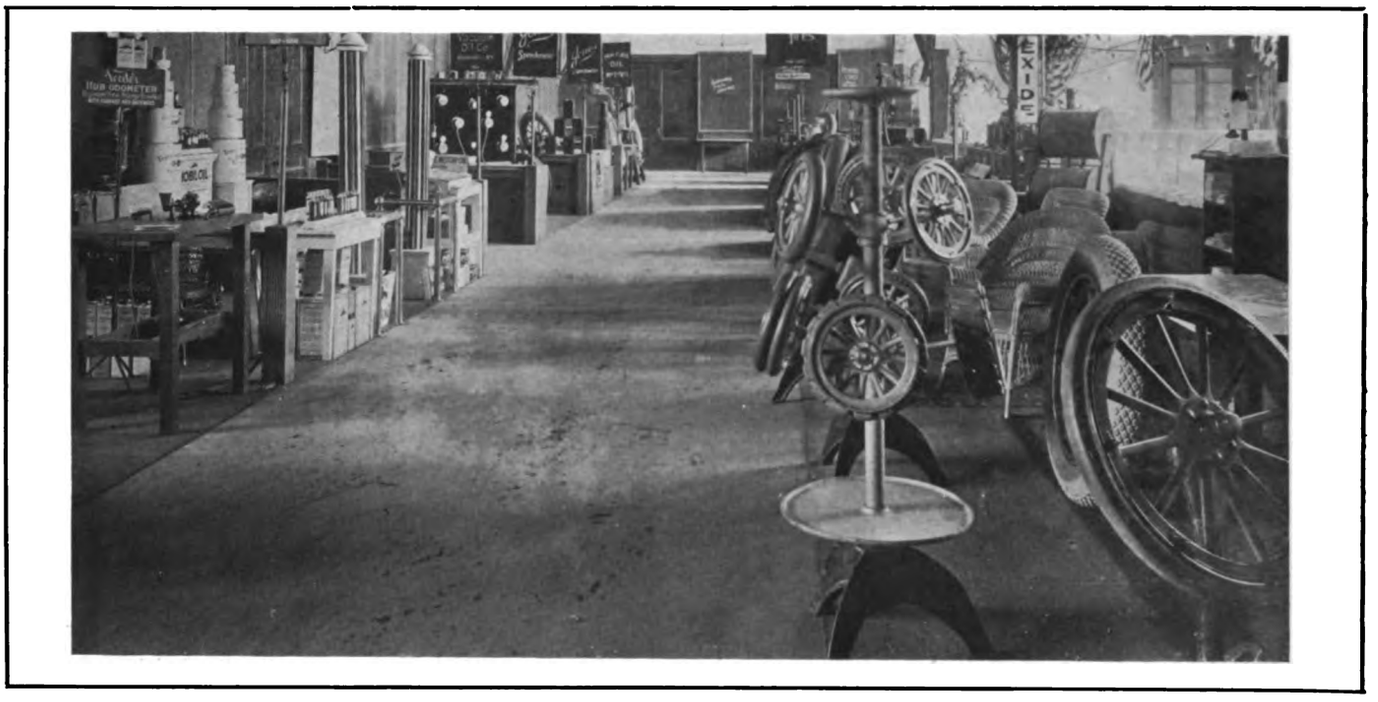
the entire show, and 10 displays about 45 per cent., leav- for the other 51 about 55 per cent. Regarded simply from the number of machines shown and the proportions as indicated, it must be admitted that the possibilities of a real buyers' exposition, such as the Boston show has always been, were not understood by many. This is not criticism of those who had a single vehicle to represent them, but it is meant to emphasize that those who expected to obtain the largest returns of business made demonstration of the differing forms of chassis and equipment as their spaces would permit.

It is hardly necessary to point out how essential it is for the man who is examining the exhibits in a show, with the intention of buying or of changing his haulage equipment, to see as many bodies as can consistently be shown, for few men can conceive the possibilities of the bare chassis. If assisted by a body building expert it might be possible to draw fairly reasonable approximations, but the man who has practically no knowledge of body construction may be regarded as almost helpless. There are instances where but a single form of body is fitted to a chassis, but these are extremely infrequent, and it might be said that it is entirely practical to install any one of many types of construction upon a single chassis.

There was one condition manifest that should receive the most careful consideration of the exhibitors. Of the number actually showing service wagons 22 had exhibits at the pleasure car show. The strain of preparation for both exhibitions and the display and demonstration, with the additional work created by the general promotion of interest by the first show, and the inability to secure the experienced salesmen and demonstrators temporarily needed, was severely evidenced. The demands upon the exhibitors and their assistants by increased business and the activities of the show were such that the men were thoroughly exhausted and subjects that should have been given the closest attention were neglected or deferred. The interest in the service wagons was a sufficient reason to justify the exhibitor giving to each visitor every attention, yet in some instances displays were in the care of but one person for considerable periods, causing those desirous of obtaining information long waits and very evident impressions of business laxity or negligence, which were entirely unnecessary.

The Search for Knowledge.

If there was one thing impressed upon those who observed the show and its visitors it was that a prospective purchaser of a vehicle was systematic in his search for knowledge, and while there may not have been a specific object in mind at the outset there was unquestionably a class found suited to certain purposes that impelled and received attention. This fact differentiates the service wagon exhibition when contrasted with a pleasure car show. With the prospective buyer of a wagon or truck, capacity with reference to the operating conditions is the main desideratum. There may be differing values with a single classification, but service is the first and last quality sought, and this must be first of all determined by capacity. It may be possible for the purchaser to determine such systematizing of his delivery and haulage that he can adapt larger vehicles than were first considered, and it may be practical to turn from the large to the smaller by adopting another system, but under ordinary conditions the buyer must be attracted by what appears to be adapted to his purposes and within his financial reach.



The East Aisle of the Main Accessory Department Looking Toward Paul Revere Hall, with the Kelly-Springfield Tire Company's Display in the Foreground.

From the attitude of the exhibitor the show at its conclusion was a success because of its remarkable productiveness. The visitors were buyers and the exposition was hardly inaugurated before "sold" signs appeared, and as the exhibition progressed these were greatly multiplied. Business was transacted by all who had stands, and with rare exceptions the transactions largely exceeded expectations, for it was very generally assumed that while there would be prospects developed these would, if from a distance, conclude negotiations through the community representatives. The sales made were of all types of vehicle. The transition from animals to power is not confined to any classes of industry or commerce. There were, however, certain enterprises that were directly attracted toward wagons of large capacity, these including those dealing with freight and express haulage, coal, ice and building materials, contractors, builders, and others requiring the transportation of heavy and bulky loads.

The approach of warmer weather and the resumption of construction work of all kinds was a cogent reason for the

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keen concern manifested by those engaging in such undertakings, and the anticipated activity in the coal and ice markets, as well as the impending removals of thousands from winter to summer residences had the effect of stimulating those who transport them to preparations to meet with the expected increase in demands. But beyond this was an intense desire to acquire information relative to all manner of transportations. One of the facts strongly impressed upon the observer was the acceptance by those in business of the knowledge of the manufacturers and salesmen of all conditions of haulage. There was recognition of the careful study of the subject as a whole and understanding that what had been regarded as theory was accurate information based on careful compilation of data accumulated from innumerable sources.

Until now there has been general assumption that it is impossible for a man, however expert, to determine the relative expense of animal and motor transports, but it has been proven by statistics that cannot be rejected that there is not only a sufficient economy to justify the adoption of the service wagon, but as the animal vehicles are eliminated there will be a saving proportionate to the use of the power conveyances. The realization of the proportions of the haulage problem and the possibilities for service vehicles has been very general and there is reason to believe that there will be as the result of the show a constantly increasing market for all forms of wagons and trucks.

One evidence of this was the considerable number of agencies made by makers and distributors. This insures to many active representation in localities that had previously been neglected and which are regarded as extremely promising. The opinion is well established that there ought to be the same constant market for service wagons that has obtained in the past with animal vehicles, and there is a prevailing belief that the establishment of service stations that will afford to those whose requirements are not such as to justify a private garage whatever attention is necessary or desirable, is the next logical development.

Details of the Exhibits.

The exhibits were as follows:

Alco—One two-ton and one 3.5-ton truck, and one five-ton chassis.

Atterbury—One 1500-pound delivery wagon, one one-ton delivery wagon, one 1.5-ton delivery wagon, one two-ton delivery wagon, one three-ton truck, one 20-passenger omnibus.

Autocar—Six 1.5-ton delivery wagons, one ambulance, one 15-passenger omnibus, one 1000-pound chassis, one 1500-pound chassis.

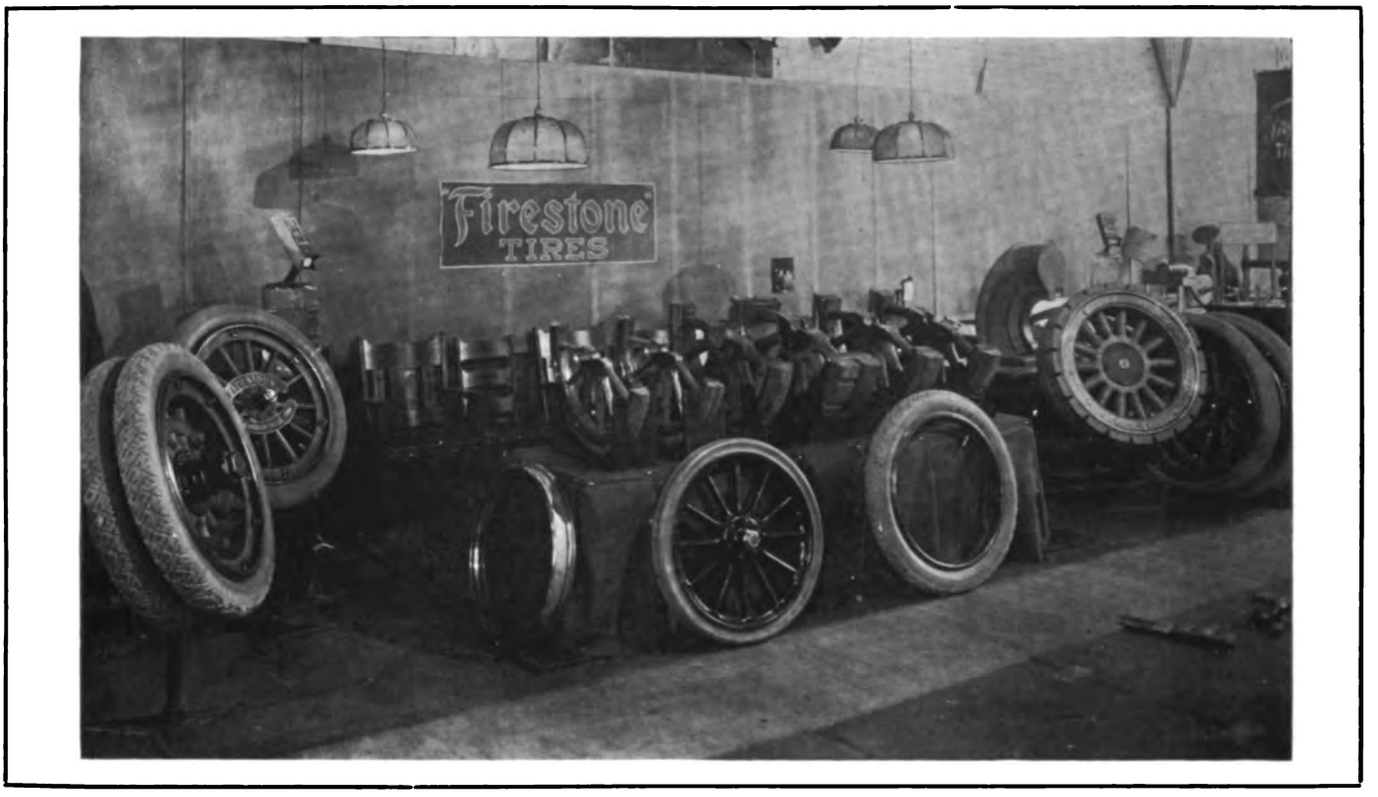
Bessemer—One one-ton delivery wagon.

Buick—Four one-ton delivery wagons, one combination chemical fire apparatus.

Baker electric—Two 1000-pound delivery wagons, one two-ton chassis.

Chase—One one-ton delivery wagon, one 1.5-ton delivery wagon.

Clark—One three-ton truck.



The Exhibit of the Firestone Tire & Rubber Company, Which Consisted Wholly of Shoes Designed for Heavy Vehicle Service.

Commer—One 6.5-ton dumping body truck, one 6.5-ton chassis.

Commerce—Two 1000-pound delivery wagons, one 1000-pound chassis.

Couple-Gear electric—One five-ton dumping cart, one five-ton bottom-dumping wagon.

Chalmers—One 1000-pound covered delivery wagon.

Decatur—One 1.5-ton delivery wagon, one five-ton chassis.

Dayton—One 1.5-ton delivery wagon, one three-ton truck, one five-ton chassis.

Eckhard—One five-ton chassis.

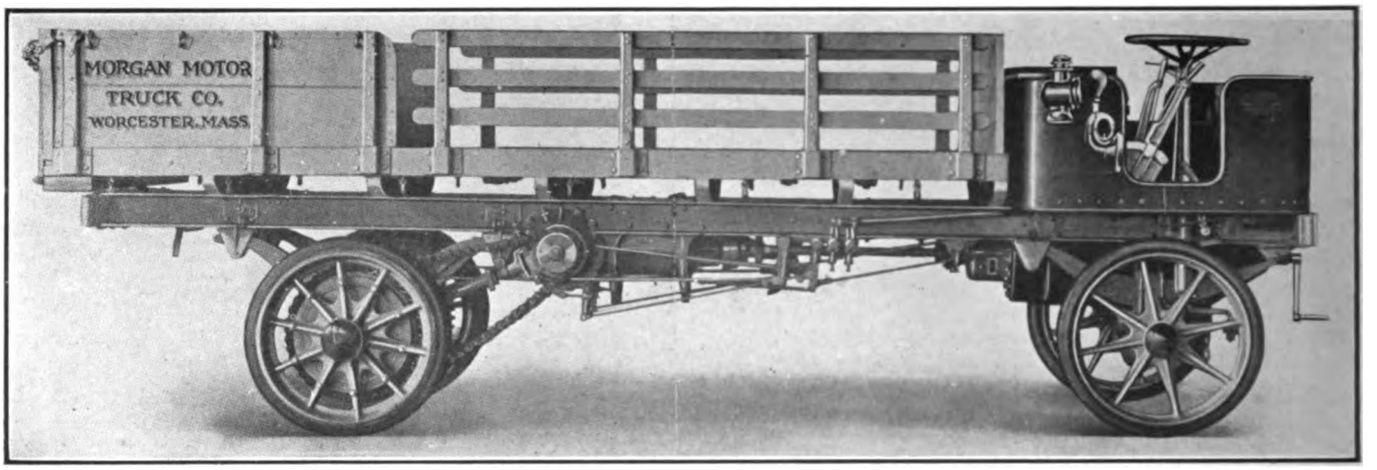
Ford—One 700-pound enclosed delivery wagon.

Federal—Two one-ton delivery wagons, one one-ton chassis.

G. M. C. gasoline—One one-ton delivery wagon, two two-ton delivery wagons, two 3.5-ton trucks, two five-ton trucks, one two-ton chassis, one 3.5-ton chassis.

G. M. C. electric—One four-ton truck, one five-ton truck,

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The Model A Morgan Truck, Five Tons Capacity, the Latest Development of Heavy Vehicle by the Maker.

one three-ton chassis.

General Vehicle electric—One one-ton delivery wagon, two two-ton delivery wagons, one five-ton truck, two two-ton chassis, one ambulance.

Grabowsky—One one-ton delivery wagon, one five-ton chassis.

Garford—One 1.5-ton delivery wagon, one five-ton chassis.

Gramm—One one-ton delivery wagon, one two-ton delivery wagon, one three-ton truck.

International Harvester—One 1000-pound delivery wagon, one 1500-pound delivery wagon, one 2000-pound delivery wagon.

KisselKar—One one-ton delivery wagon, one two-ton delivery wagon, one three-ton truck, one one-ton chassis, one four-ton chassis.

Kelly—Four 1.5-ton delivery wagons, five three-ton trucks, one four-ton truck, one omnibus on 1.5-ton chassis, one sightseeing wagon with 1.5-ton chassis, one 1.5-ton chassis.

Koehler—One 1600-pound delivery wagon.

Knox—One two-ton delivery wagon, one three-ton truck, one six-ton chassis, one patrol wagon, one combination hose and chemical fire wagon, one 60 horsepower fire pumping engine and combination apparatus, one Martin tractor.

Lauth-Juergens—One three-ton truck, one one-ton chassis.

Locomobile—One five-ton chassis, one combination hose and chemical fire wagon.

Lozier—One five-ton chassis.

Lansden electric—Two one-ton covered delivery wagons.

Mack—One 1.5-ton furniture wagon, three two-ton delivery wagons, one three-ton furniture van, one three-ton oil tank truck, one five-ton brewery truck, two five-ton coal dumping body trucks, two seven-ton gravel dumping body trucks, one two-ton chassis.

Mais—One 1.5-ton delivery wagon, one two-ton delivery wagon, one 1.5-ton chassis.

Martin—One three-wheeled tractor.

Mercury—Three 1000-pound delivery wagons.

Modern—Three 1500-pound delivery wagons.

Mora—One 1000-pound delivery wagon.

Morgan—One two-ton delivery wagon, one three-ton truck, one five-ton truck.

Motor Wagon—Two 1000-pound delivery wagons.

McIntyre—One two-ton delivery wagon.

Packard—Eleven three-ton trucks with different body equipments, one two-ton truck, one two-ton chassis.

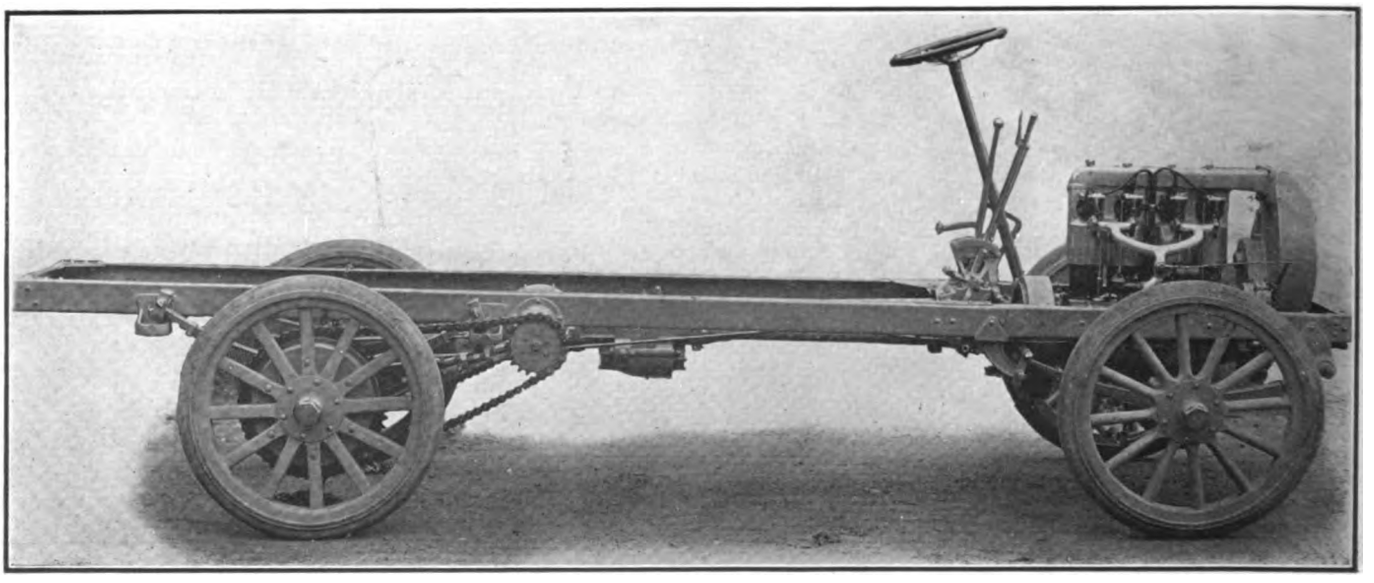
Peerless—One three-ton truck, one four-ton truck, one five-ton truck, one three-ton chassis.

Pierce-Arrow—Three five-ton trucks, one with dumping body, and one five-ton chassis.

Pope-Hartford—Two three-ton trucks and one combination chemical and hose fire apparatus.

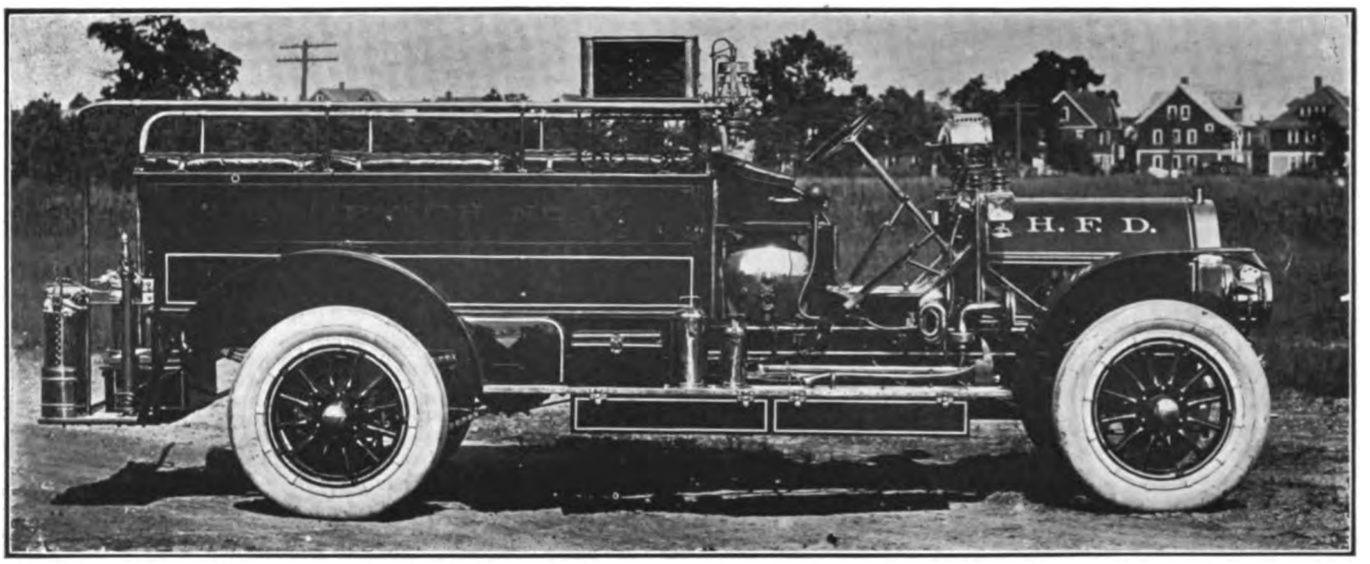
Poss—Two 1000-pound delivery wagons.

Sampson—Two 1000-pound delivery wagons, two 1.5-



The Kelly 1.5-Ton Wagon Chassis, Which Is of New Construction from the Power Plant to the Rear Axle.

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Combination Chemical Engine and Hose Wagon Equipment Installed on a Knox Chassis.

ton delivery wagons, one three-ton truck, one five-ton truck and one five-ton chassis.

Sanford—Two one-ton delivery wagons.

Sandusky—Two 1.5-ton delivery wagons.

Speedwell—One two-ton delivery wagon, one four-ton truck and one six-ton truck.

Stanley steam—One one-ton delivery wagon, one 12-passenger omnibus.

Stearns—One five-ton truck.

Sternberg—Two two-ton delivery wagons, one four-ton chassis.

Saurer—One 4.5-ton truck, one 6.5-ton brewery truck, one 6.5-ton chassis, one fire pumping engine.

Overland—One 1000-pound delivery wagon.

Reo—Three 1500-pound delivery wagons.

Teel-Woodworth—Two three-ton trucks, one three-ton chassis.

Velie—One three-ton truck, one three-ton chassis, one five-ton chassis.

Victor—One 1.5 ton delivery wagon, one 3.5-ton truck.

Walker electric—Two one-ton delivery wagons, one one-ton chassis.

White—One 1.5-ton delivery wagon, one two-ton delivery wagon, four three-ton trucks, two five-ton trucks, one 1.5-ton chassis, four three-ton chassis, one five-ton chassis.

Waverley electric—Two 1500-pound delivery wagons, one 1500-pound chassis.

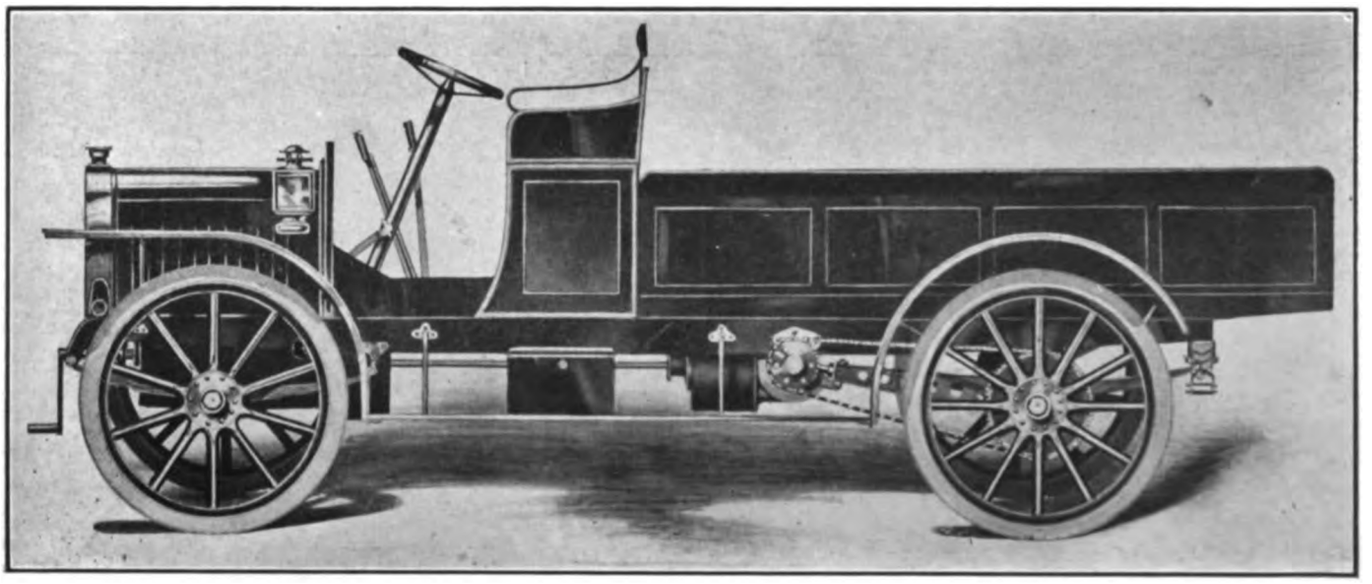
Seen for the First Time.

The makers of wagons shown for the first time at any show were the Clark, Eckhard and Stanley. Those displayed for the first time at any national exhibition were the Chalmers, Couple-Gear, Ford, Mora and Teel-Woodworth, and the Mais was seen for the first time at any 1912 show.

The makes that were not represented at the 1911 exhibition were the Bessemer, Baker electric, Chalmers, Commerce, Federal, Gramm, G. M. C. gasoline, G. M. C. electric, KisselKar, Koehler, Lansden, Lauth-Juergens, Locomobile, Lozier, Mack, Mais, Mercury, Modern, Mora, Motor Wagon, Martin tractor, Pope-Hartford, Poss, Reo, Sandusky, Sanford, Saurer, Stearns, Sternberg, Velie, Walker and Waverley.

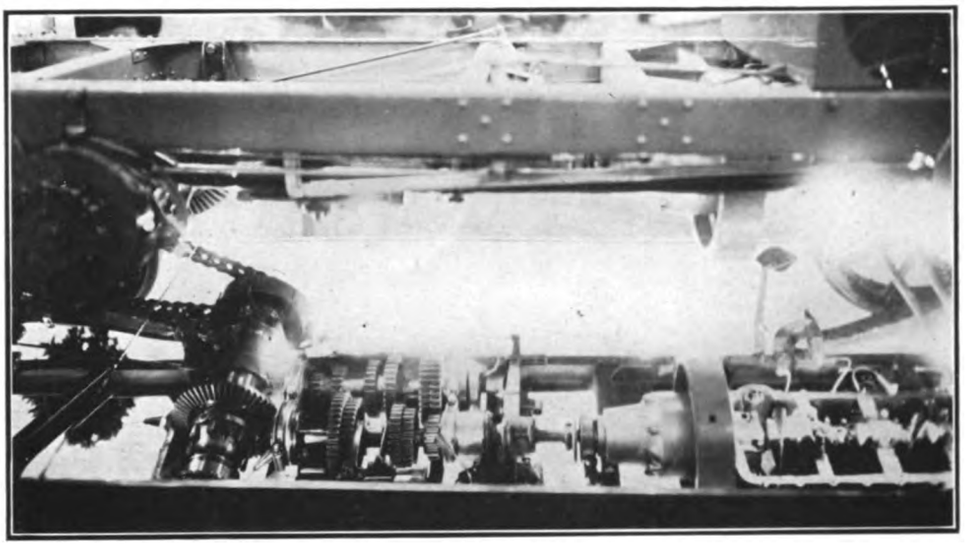
The makes that were displayed in 1911 were the Alco, Atterbury, Autocar, Buick, Chase, Commer, Dayton, Decatur, Garford, Grabowsky, General Vehicle, International Harvester, Kelly, Knox, Morgan, McIntyre, Overland, Packard, Peerless, Pierce-Arrow, Sampson, Speedwell, Victor and White.

Those that made display in 1911 that did not engage space included the Atlas, Beyster-Detroit, Brush, Cass, Detroit electric, Franklin, Harder, Harrison, Hupmobile, John-



The Bessemer Delivery Wagon, One Ton Capacity, the Only Vehicle Exhibited Equipped with a Self-Starting Device.

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Locomobile Five-Ton Truck Chassis, Exhibited Above a Mirror with the Mechanism Exposed So That the Construction Could Be Clearly Seen.

son, Randolph, Stoddard-Dayton, Warren-Detroit and Wilcox. The Rapid and Reliance have been succeeded by the G. M. C. gasoline vehicles, and the Ford taxicab and the Clark two-cycle motor truck were succeeded by the machines stated above.

The largest number of chassis shown was 14, the Kelly and the White each making that display. The Packard was second in point of numbers with 13, the Mack and G. M. C. third with 12 (both electric and gasoline being shown by the G. M. C.), the Autocar fourth with 10, the Sampson fifth with seven, the Atterbury, General Vehicle and Knox sixth with six each. Of the other exhibitors three showed five chassis, three four chassis, 19 three chassis, 14 two chassis, and 12 but one chassis.

The largest number of bodies shown of any one make of chassis was by the Kelly trucks, all the chassis being fully equipped save for one polished 3000 pounds capacity machine. Next was the Packard which showed 12 complete trucks and one chassis in the lead. Third in this classification was the G. M. C. with nine bodies, and the White and the Autocar were fourth with eight bodies each. Somewhat out of the usual manner of exhibition was the showing of the Koehler wagon, there being one chassis with an enclosed body and two bodies of other types, this giving the visitors opportunity of examining the equipment and passing upon the qualities as shown.

The Matter of Motive Power.

With reference to the motive power of the vehicles 53 makes were fitted with internal combustion engines, and of these 48 were of the water-cooled type, there being the Chase, International Harvester, Mercury and Sanford in the air-draft radiation classification, and the Kelly with blower cooling. Of the others the Baker, Couple-Gear, G. M. C., General Vehicle, Lansden, Walker and Waverley are electric motor driven, and the Couple-Gear and the Walker are equipped with wheel drive. The Stanley machines are fitted with steam engines in every way similar to those used in the Stanley pleasure cars, but the chassis construction is different.

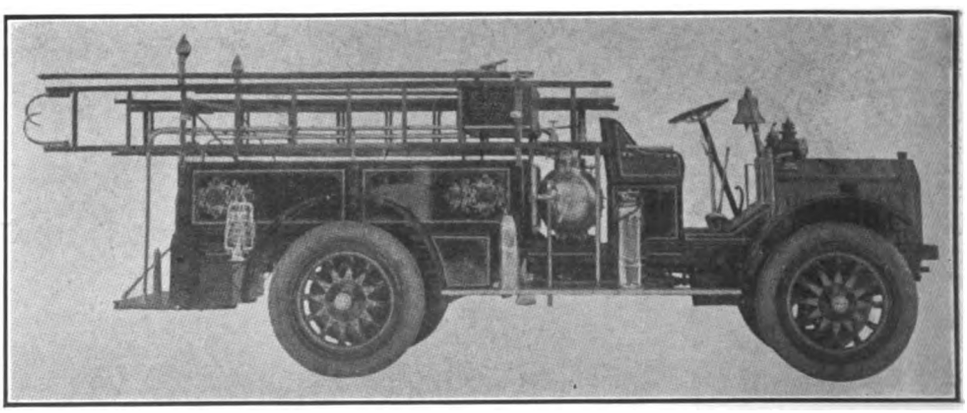
While there was a gain of 19 different makes of cars in the total of exhibitors one of the conditions that emphasized itself was the increase of the electric wagons and trucks. The gain was from two a year ago, and while the Baker, Walker and Waverley are of the delivery wagon type, the Couple-Gear installations have been with particular attention to slow and heavy work and the G. M. C. vehicles are designed for moderate and heavy loads. There has undeniably been an interest created in electric machines that are intended for all classes of service and the attention of the manufacturers has been directed toward undoubted advantages of these vehicles for certain service. In the utilization of electric wagons the very rapid increase in the number of stations where energy may be obtained, and the preparations made by lighting and power plants to include vehicle battery charging as a public service, one of the obstacles to more general use has been largely dissipated, especially in the East, where these stations are to be found and where the price for charging has been uniformly established.

That the distance is really no serious condition was practically demonstrated when a Walker delivery wagon was driven from New York to Boston, the conditions being at least the average of a winter, at a speed approximating 10 miles for the time actually on the road. The wagon was exhibited at the show as it came over the road. The battery was given a "boost" wherever there was opportunity and the wagon was driven with ample reserve under all conditions of use.

Rated as to Capacity.

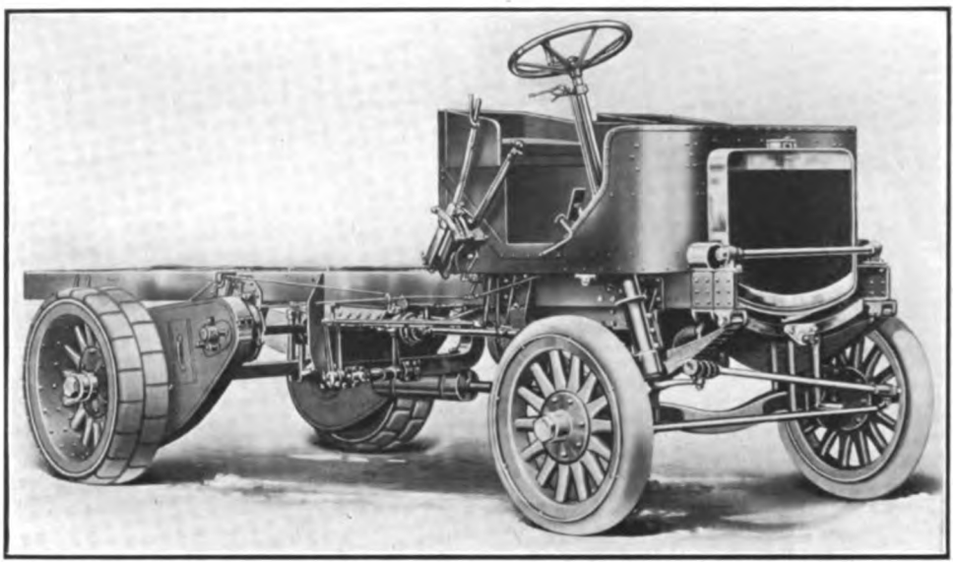
In considering the different vehicles exhibited and their capacities it will be realized that approximately 70 per cent. were of three tons or less, and it is interesting to reflect upon the following figures, which indicate that the wagons and trucks are types that ought to have material rapidity of movement. The summary demonstrates the following facts:

Capacity, pounds	Number shown	Capacity, pounds	Number shown
700	1	7,000	7
1,000	22	8,000	6
1,500	9	9,000	1
1,600	1	10,000	29
2,000	26	12,000	2
3,000	28	13,000	4
4,000	27	14,000	2
6,000	44		



The Kelly 1.5-Ton Chassis Equipped for Fire Service as a Combination Hose and Chemical Apparatus.

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The Knox Truck Chassis of Six Tons Capacity, This Machine Being Displayed for the First Time in Boston.

Regarding these figures as fairly representative it will be understood that the representation is largely of vehicles that may be classed with heavy express wagons, there being a very uniform demonstration of the different classifications. The light wagon may be assumed to have capacity of 1000 pounds, the medium wagon from 1000 to 3000 when drawn by a single horse, the heavy wagon from 3000 to 5000, the light truck or dray from 5000 to 7000, the heavy cart or truck from 7000 to 10,000 when drawn by three or four animals. For unusually heavy service the dray or truck may be specially constructed to have capacity in excess of these figures. It will be understood that the reference to animal vehicles is made with the view of making clear the types of service wagons that may be regarded as suited for similar requirements.

A glance at these figures will also show that despite the supposition that the power wagon is necessarily heavy and has very large capacity the larger number of the machines purchasable in the market are what may be adapted to practically any haulage. Another fact impressed upon the observer is that the makers are producing wagons that are light, comparatively high powered, and with such speed as to justify a conclusion that they could be well adapted for delivery purposes.

The opinion prevails very generally that the greatest economy of the service wagon is in superior speed, next in its greater capacity, then in its uniformity of work for a considerable period, and in its reserve as compared with the animal. It is also assumed that increased load is the most potent qualification, especially if the hauls are long, but it would appear that the opinion of the designer and maker is that the largest utility obtainable is comparatively small loads and material speed. Though it cannot be said that the exact aspect can be obtained from a single exhibition, it is entirely reasonable to base a conclusion on a display that is in every way representative with reference to the industry, the trade and the market.

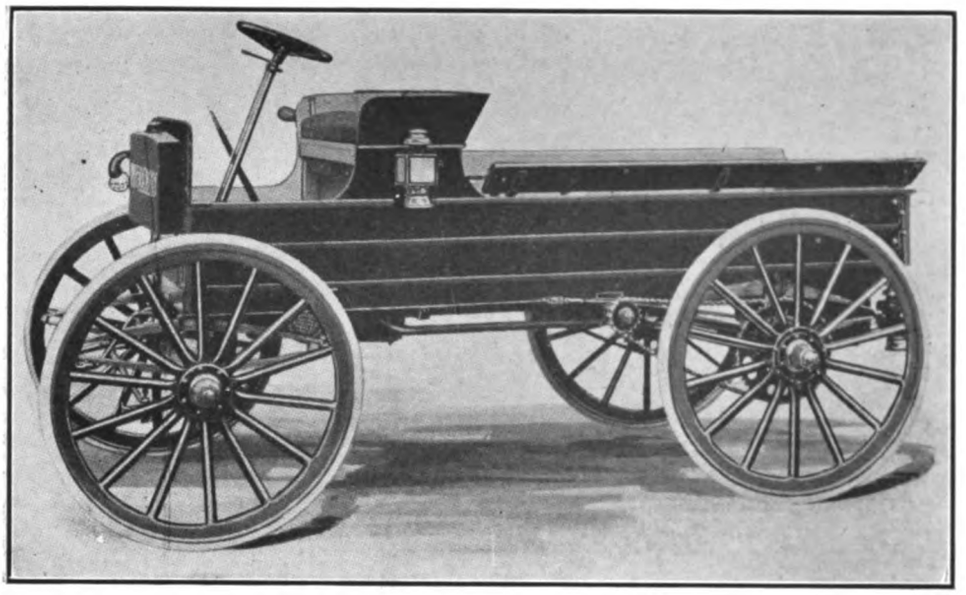
Relative to trucks of 10,000 pounds capacity or more the equipment was designed in the greater number for haulage of coal, ice, gravel and building and construction material. Being designed for such service the bodies were generally fitted with means for quick discharge. Some of the bodies, especially those installed on White, Peerless, Sampson and Alco trucks were elevated by power hoists. These were of differing types, those of the White and Alco being arrangements of compound gears, that of the Peerless by a worm and nut, and that of the Sampson by an air compressor. These hoists were all fitted with stops so that the power might be automatically stopped when the bodies reach maximum elevation, there being no possibility of mishap in the event of carelessness by the driver or operator. The principal purpose was primarily to minimize labor and expedite the time of discharging. The elevation of any body means a gravity discharge into chutes or through end gates, an entirely satisfactory method under some conditions, but for the unloading of coal in the street, especially if the way be narrow the side discharge is desirable. This is accomplished with the Monahan body equipment of the six-ton Speedwell truck by forward or rear side outlets, in addition to the large end gate, by which the coal may be carried across walks or to manholes by chutes. This machine is equipped with a hand hoist by which the body may be raised to a maximum of 42 degrees by the driver in two minutes.

The Morgan coal truck is shaped internally with the sides and ends forming a hopper with sides inclined about 35 degrees. The load is discharged through an outlet at the right side by a huge worm that revolves in a channel into which it descends by gravity and into an adjustable circular chute that may be extended from the side direct to a manhole or coal bin inlet. The majority of the other coal or building material trucks, including the Pierce-Arrow, Packard, Peerless, Kelly, Mack and Commer, were equipped



Eckhard Six-Cylinder Truck, the Only Machine of This Type Displayed at the Boston Show—This Vehicle Has Many Exclusive Features.

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The Mercury Delivery Wagon, This Chassis Having an Opposed Cylinder Air-Cooled Motor and Transmission in a Unit Assembly.

with hand hoists and the discharge was generally at the rear gate. There is no question that the power hoist has many advantages and is desirable equipment, but most installations may be adapted to any truck. The expedition of unloading is a weighty factor with those who are engaged in construction and contract work and there is but little doubt that there will be special attention directed toward the improvement of the facilities that are now available.

Distribution of Load.

With many of the bodies carried on trucks it would appear that the one condition that could be studied advantageously is that of the location of the centre of load gravity. With the general construction the increased tread is a result of the width of the wheel rims, the ribs being often 12 or 14 inches wide, and this means from 24 to 30 inches must be allowed aside from a reasonable clearance outside of the driving chains. With many chassis the frame is carried above the rear springs instead of being suspended between them, and to permit sufficient compression and recoil of the suspension to absorb the shocks, the frame is considerably above the axle. This condition heightens the centre of gravity and when the load is bulky the weight is not equalized. There is apparently no unanimity of opinion as to the best form of body to be adapted to certain work. In fact, it would seem that there is as much variance in design as there is in any other mechanical construction.

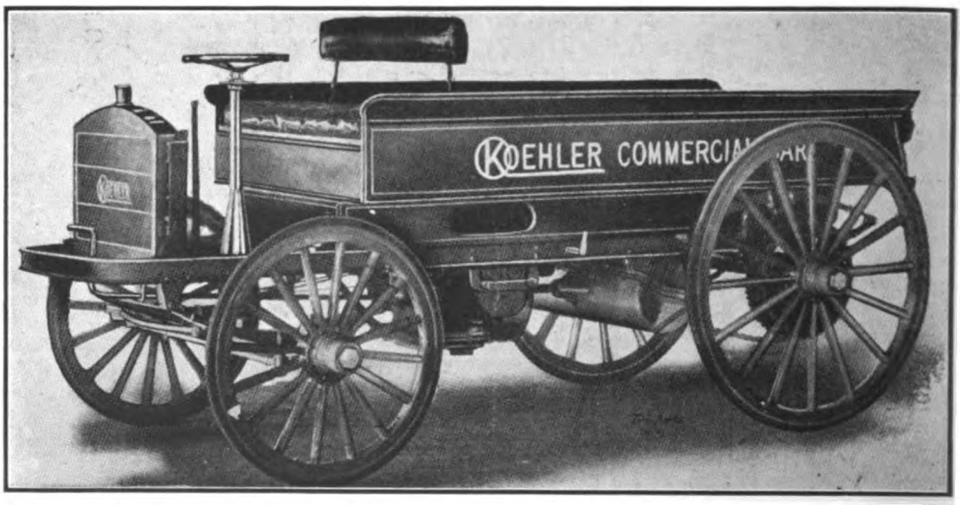
Perhaps one of the most noticeable facts impressed upon the visitor to the show was the difference in the proportions of load with reference to the front and rear axles. The range for the front axle is from five to 35 per cent. and from 65 to 95 for the rear axle, this applying, of course, to the trucks, and especially to the largest types. With the lighter vehicles the proportions are much more uniform and it may be said that the variance is about 15 per cent. from 65 to 80. The wagons with capacities from 700 to 1600 pounds were often fitted with open bodies, it apparently being an assumption by the makers that these could be enclosed at will by the buyers, but it would appear that this is a condition that has not been as carefully considered as it should.

During the winter months the power vehicle must be driven through snow and slush, there being no substitute for it as the sleigh is occasionally utilized in the place of the wagon or truck, and for that reason it is desirable that it have such enclosure as will protect the freight, especially if the service be delivery. This protection is necessary during storms and against heat and dust, and there is need of sufficient carrying space to take a capacity load should the freight be bulky. This means that a single type of covered body will not serve all requirements and it is just as necessary to adapt the light vehicle to a service as to adapt a heavy machine. There is no reason to believe that a standard body installation will serve the maker as an identification of a vehicle. Should there be such supposition it is reasonable to assume that this will be a handicap to marketing instead of a stimulus. Taken as a whole there was not the improvement made in vehicle bodies as in the chassis. This is probably due to the fact that the makers of the wagons have not a realization of the extreme variation in requirements, and to inexperience with demands that will be made upon them with the increased use.

The Clark Truck.

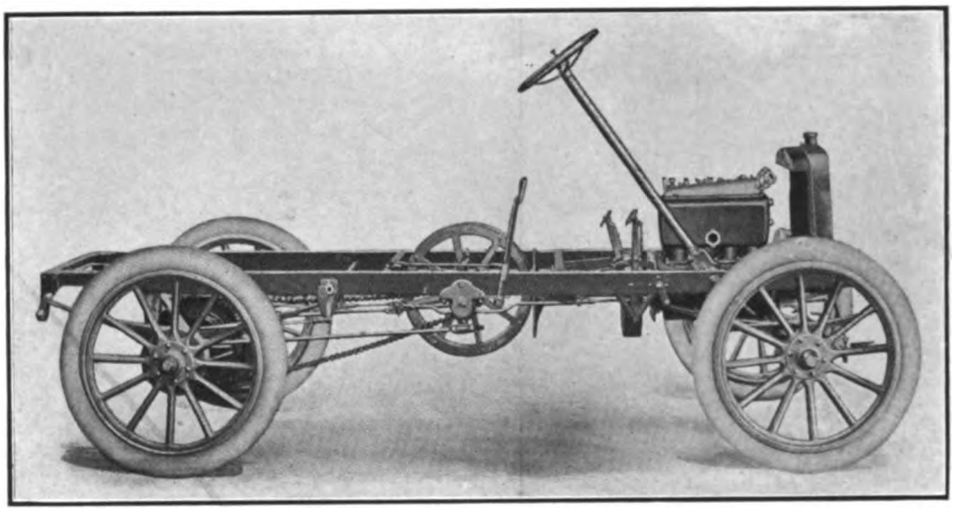
A truck that attracted much attention was the Clark, built in Boston by Edward S. Clark, who has been for years identified with the industry, but until the past two years principally by specialized steam pleasure cars, of which he produced a limited number. Last year Mr. Clark exhibited a power wagon with a two-cycle engine as a power plant. This design he has given over and is now building two types, one of three and the other of five tons capacity. The machine shown was the three-ton model, and there was also displayed the front and rear axles, jackshaft and radius rods of the larger truck.

The Clark truck is noticeable from the fact that it combines every desirable quality that long experience could



The Koehler Wagon Chassis Equipped with an Open Express Body, This Having a Capacity of 1600 Pounds.

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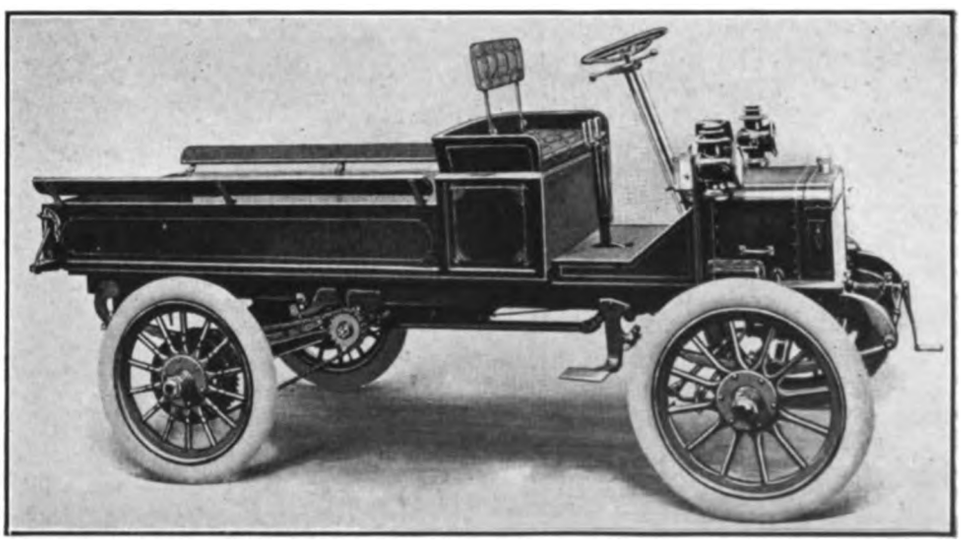
The Poss Delivery Wagon Chassis with Friction Drive and an En Bloc Motor of 25 Horsepower.

suggest, and the design's purpose was to insure service and endurance with economy of time of the vehicle and the driver in the attention necessary to insure maintenance and upkeep. The motor is mounted in a sub-frame and so low that the footboards of the driver's cab are well above it, so that there is abundant light and space for one to work on the engine under any circumstances. The motor is unusually clear of fittings and for the ordinary adjustments and attention it is not necessary to remove wiring, levers, linkage or any of the obstructions that might be expected. The steering, brake and transmission connections are installed at either side and above the motor so these may be easily reached and be out of the way of any one working on the power plant.

The motor cylinders are cast en bloc with bore of 4.125 inches and stroke of 5.25 inches, the engine being rated at 35 horsepower. The casting is carefully finished and very careful workmanship is noticeable throughout the assembly. The water jackets are liberal in size and the water is circulated by a large centrifugal pump, the cooling being by a large vertical tube radiator and a fan mounted forward of the engine, driven by a flat belt. To insure complete lubrication two gear driven plunger pumps operated by the camshaft are used. The oil is carried in a reservoir in the base of the engine case and from this the lubricant is drawn through filters and circulated through a system of tubes to a sight feed on the dash and thence the main bearings are flooded whenever the motor is in operation. There is a level of lubricant maintained in the engine case and the other moving parts of the motor are lubricated by splash. The ignition is a dual system using the Bosch high-tension magneto, the wiring being especially well protected from wear and saturation by water or lubricants. The carburetion of fuel is by a float feed carburetor with a water jacket to insure uniformity of mixture.

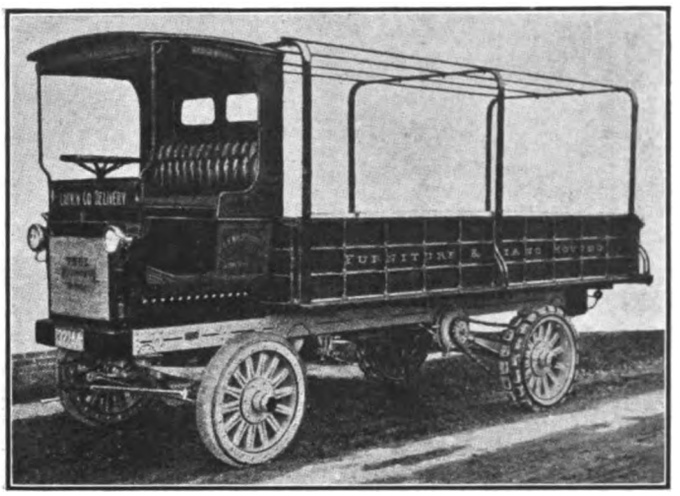
The clutch is a cone type engaging with the flywheel and under the leather facing flat springs are installed to prevent harsh or sudden engagement. The drive is by shaft to a Timken rear driving system, through a large jackshaft and double side chains to a dead rear axle. The transmission gearset is a selective type with three forward speeds and reverse, it being fitted with Timken adjustable roller bearings throughout. The jackshaft is equipped with a locking device by which the differential may be locked and the rear wheels driven as a unit in the event of unequal traction. This lock is operated by a handle at the left side of the chassis frame. On the jackshaft is the service brake operating on drums 12 inches in diameter and 2.25 inches width, being actuated by a pedal. The emergency brake is by expanding shoes within drums 18 inches diameter on the rear wheels, operated by a hand lever that may be set by a pawl and notched quadrant. The frame is six-inch rolled steel channel section, 42 inches width and length proportionate to the body. The standard wheelbases are 120 and 130 inches. The tread is 68 inches. The frame is built with heavy cross members and is strongly braced. It is mounted on semi-elliptic springs 42 inches length forward and 52 inches length rear, three inches width. The rear suspension is supplemented by a heavy cross spring that strengthens the action proportionate to the load carried. The front axle is a drop forged steel I section and the rear axle is a rectangular steel forging 2.25 by 3.625 inches. The wheels are 36 inches diameter, mounted on Timken roller bearings, with 36 by five-inch solid shoes forward and 36 by four-inch dual at the rear.

The control is by a vertical steering column located at the left side, pedals operating the clutch and service brake, hand levers at the centre that actuate the speed changes and the emergency brake, and hand levers on the steering wheel controlling the throttle and the ignition. As regularly geared the truck has 12 miles an hour maximum speed. The manner in which the chassis frame is mounted on the forward springs, there being a short and heavy spring horn, the installation of the radiator on helical springs carried in substantial tubing to eliminate the vibration of the truck on rough roads, the grease cups on every wearing part of the chassis, the location of the 20 gallons capacity gasoline tank under the driver's seat, the jointed starting crank,



The Mora Delivery Wagon, with an Opposed Water-Cooled Engine, Left Side Drive and Centre Control Levers.

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The Teel-Woodworth Truck of Three Tons Capacity, Which Has Fixed Spark and Foot Accelerator Control.

the heavy tube bumper to protect the radiator and the lamps, the strength of the steering connections and the tiebar, indicate a studied attention to design detail that appeals to the mechanical mind.

Eckhard Six-Cylinder Model.

What may be regarded as the novelty of the show was the Eckhard five-ton truck, another Boston production, made by the Hercules Motor Truck Company, which was fitted with a six-cylinder motor of highly commendable design and finely finished. It is rare indeed to find a pleasure car engine that has been as carefully built, the workmanship being such as to attract the attention of every engineer and mechanic. It was exhibited as the result of 12 years' experience and experiment, and the features, aside from the motor, are the double clutch, the interlocking device, the torsion bar, the torsion chain, and the governor. It is the design of John Eckhard and there is in every detail the evidence of the care to construct what will yield service and endure under extreme conditions.

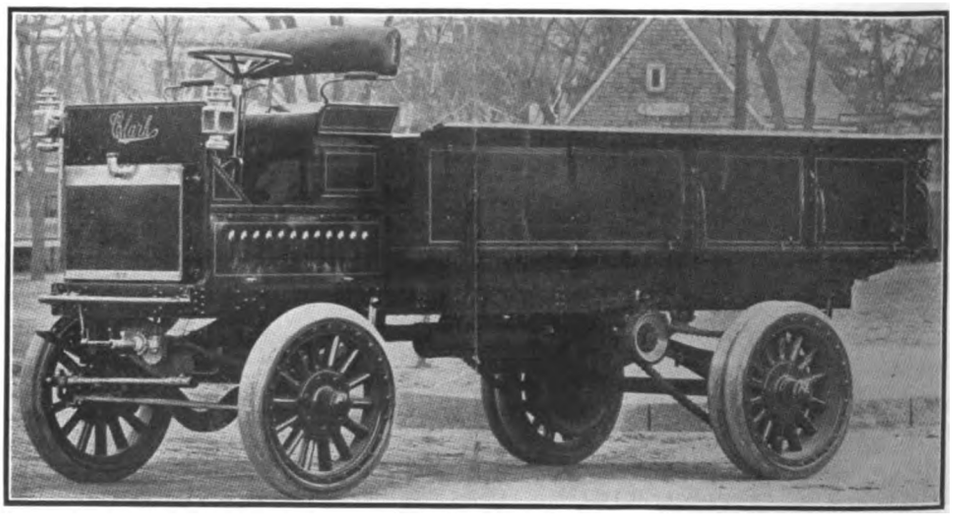
The engine is of the valve-in-the-head type with the cylinders cast in pairs, having bore of 4.5 inches and stroke of five inches. The horsepower rating by the S. A. E. standard is 48.6, but the maximum service speed permitted is 900 revolutions, at which, by brake test, 54 horsepower has been developed. In the engine every element has been designed with a view of securing the height of accessibility, and there is no operation or work necessary under ordinary conditions that cannot be performed with extreme ease. To illustrate, the valves are operated by pushrods lifted by a camshaft at the right side. The valves are all installed in separate cages and each pair of cages is retained by a yoke which may be removed by turning off a single nut, this permitting the cages to be taken out. The cams are large and the pushrod lifts are in the form of square sleeves fitted into steel guides, the sleeves carrying large hardened steel rollers, this minimizing the wear. These guides are yoke retained and can be lifted out by the removal of a yoke retained by a single nut.

The rocker arms are of splendidly finished bronze and they are pivoted on hardened steel pins of large size, the bearings being lubricated by oil ducts drilled in the rocker arms which are supplied from individual oil wells. Should it be necessary the main bearings, connecting rod bearings, and the interior of the engine may be reached by removing a cover plate extending the length of the crankcase, at the left side, while three large hand holes afford access as desired at the other side of the case. The single camshaft drives a series of bevel gears and in turn actuates the water pump, the oil pump, the magneto and the governor. The gears are encased by a bronze housing that may be readily removed and an extension of this protects the governor, which is of the ball type. The crankcase is of aluminum.

The cooling system is unusual, having very large water capacity and generous water spaces, the jackets being designed to secure rapid circulation. The water pump is of correspondingly large capacity and is installed in a bronze housing. The radiator is bolted to the main frame, its construction being such that it is not subject to damage from vibration. The top and bottom sections are bronze castings and copper tubes with large flanges for radiation are swaged into them, being expanded in the holes as are steam boiler tubes. The tubes are very heavy and are numerous, the flanges greatly increasing the radiating surface. The tubes are protected by an iron screen installed before them on the radiator frame, this being carried upward to support the forward end of the cab roof. The engine is further cooled by a large blower with bucket shaped blades that causes a circulation through the radiator.

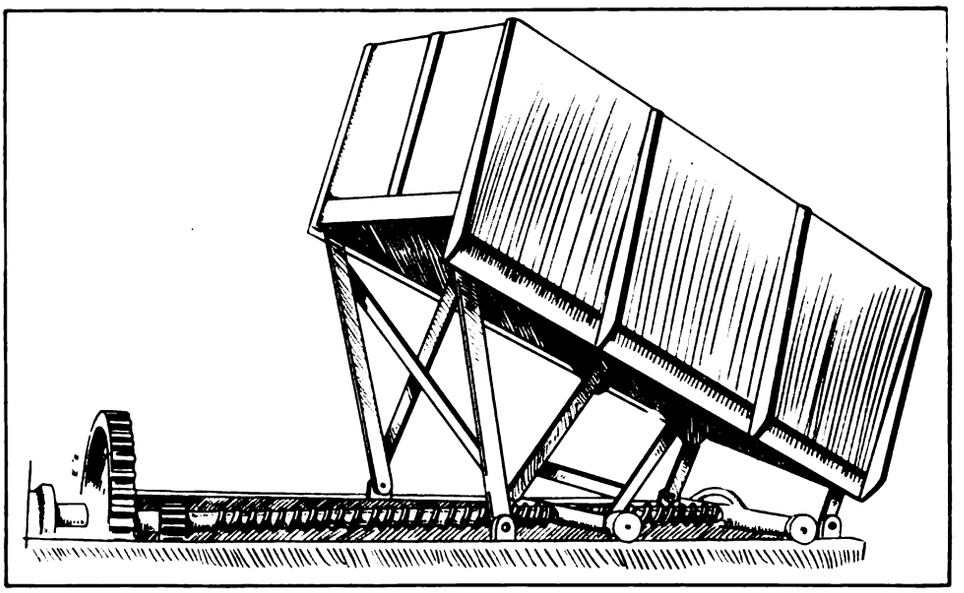
The engine lubrication is by a gear driven pump that circulates a supply of oil through a system of tubes and a sight feed on the dash direct to all bearings and to each cylinder, and by splash, there being a constant level maintained in the base of the engine case. The fuel is vaporized in an automatic float-feed carburetor, this being water jacketed to afford a constant quality of gas. The ignition is by two independent systems and 12 spark plugs, using the Bosch high-tension magneto for the one, or the storage battery, transformer coil and timer for the other. These two systems may be used simultaneously if desired.

The motor is installed in a sub-frame that is mounted at the forward end on the heavy chassis frame. The rear of the sub-frame is supported at either side by swivelled links from a wide yoke that is pivoted on a frame cross member. The driving system is unique in that there is between the motor and the differential two cone clutches. These clutches are very large and both are of the reverse type. Between the forward clutch and transmission is a universal joint and the connection with the mainshaft of the transmission is flexible. The transmission is very large



Clark Three-Ton Chassis, 35 Horsepower, with En Bloc Engine, Fitted with a Furniture Body.

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Steel Lined Wood Coal Body with End Discharge, Elevated by Horizontal Worm and Gear Hoist Operated from the Driver's Seat, Installed on a Peerless Chassis.

and the shafts and gears are nearly double the size of those designed for vehicles of this class. Between the differential and the extension of the main transmission shaft is a second clutch. There is an interlocking system by which when the clutches are disengaged the transmission shaft is brought to an instant stop by a brake and change of speed can only be made when the transmission gears are not moving. The vehicle may move ahead by its momentum but the gears cannot clash nor can they be stripped. The teeth are rounded so that engagement may be made under any condition.

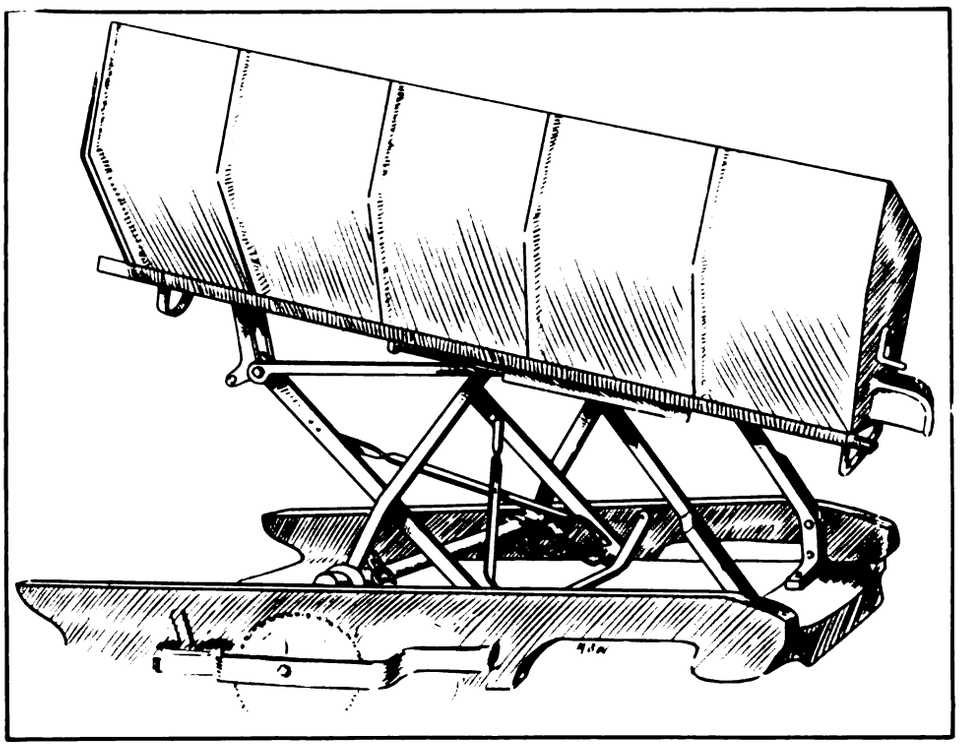
The transmission case is carried in a sub-frame, the forward end of which is suspended by swivelled links from the arms of a yoke pivoted to the heavy frame cross member, exactly as is the motor sub-frame. The rear end is suspended from a cross member behind the jackshaft. There are no stresses upon the driving system and it is maintained that under no circumstances will frame distortion have any effect upon the shafts and transmission, while the alignment will always be preserved by the radius rods. The drive from the jackshaft is by double side chains. The frame is mounted on semi-elliptic springs and these are supplemented by patented helical springs interposed between the axles and frame, these taking the load and reducing the stress upon the main springs in proportion to the needs.

Extending from the centre of the rear axle to the centre of the front axle is a long rod that is fitted with a heavy spring buffer at the forward end. The function of this device is to carry the drive of the rear wheels to the forward axle, to distribute the road shocks on the front wheels to the rear construction, and to prevent unequal movement of the axles. In this respect it serves as a distance rod and has precisely the same effect as has the perches of the animal wagon. To prevent the turning movement of the rear axle resulting from driving and braking action a torsion chain is used, this being attached to the centre of the rear cross member of the frame and extended to the end of a stout arm mounted on the centre of the rear axle and rising to a sufficient height to afford full leverage. The entire construction is with a view to minimizing the strain that might result from work under extraordinary conditions, as from striking obstructions of any kind.

The frame is of heavy steel channel section, strongly reinforced and hot riveted. The wheels are 40 inches diameter and the tires are six inches, single forward, and five inches, dual, rear. The wheelbase is 144 inches. The control is by a pinion and gear connection and a vertical steering column, with ignition and throttle lever mounted above the steering wheel, by clutch and service brake pedals, by foot accelerator, and by speed change and emergency brake levers at the right of the driver's seat. The service brake is with contracting bands operating on brake drums on the jackshaft, and the emergency brake is with shoes expanding within drums on the rear wheels. Both brakes are very large and efficient. As a further protection there is a double sprag of heavy construction that may be dropped at will by a hand lever at the driver's seat. The capacity of the gasoline tank is 22 gallons, there being a reserve tank containing two gallons that may be drawn upon when the main supply is exhausted.

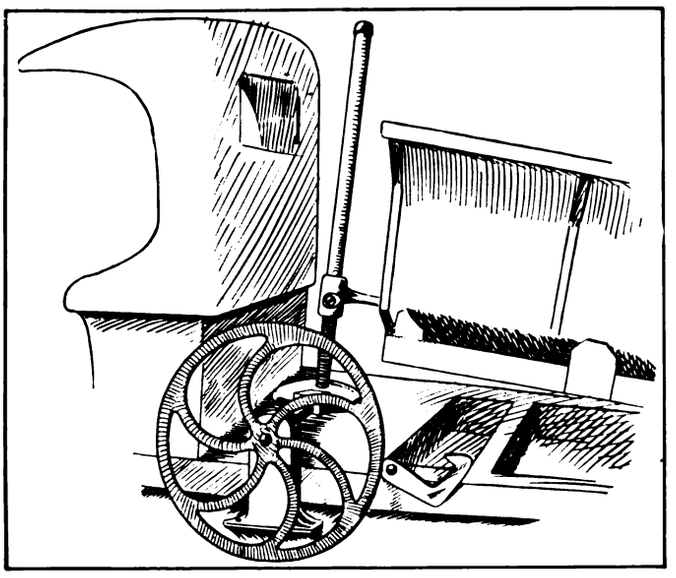
Bessemer Delivery Wagon.

The Bessemer delivery wagon, produced by the Bessemer Motor Truck Company, Grove City, Penn., was the only ve-



Steel Coal Body with Chute Discharge at the Rear, Elevated by Power Hoist, Capacity Five Tons, Mounted on an Alco 3.5-Ton Chassis.

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Worm and Nut Hand Hoist as Fitted for Use on a Pierce-Arrow Five-Ton Worm-Driven Truck.

hicle designed for purely industrial purposes that was shown with a self-starting device. This machine was noticeable for the strength and simplicity of its construction, it being maintained by the maker that it has every quality that makes for long endurance with heavy service. The capacity is one ton. But one type of chassis is built, this being with wheelbase of 107 inches. The four-cylinder motor is of en bloc construction with bore of 3.75 inches and stroke of 5.25 inches, which has an S. A. E. horsepower rating of 22.5, and is conservatively rated at 25 horsepower by the maker. The motor is water-cooled and the water is circulated by a centrifugal pump. The radiator is large and is supported by springs to eliminate vibration stresses. The lubrication is by mechanical force feed to the main engine bearings and splash. The ignition is by the Bosch dual system with high-tension magneto. The carburetor is a float feed type, automatic in action, supplying a constant mixture.

The clutch is a cone with cork inserts, having 110 square inches of frictional surface, insuring against harsh engagement or slipping, being always positive in its action. The transmission is a selective type with three forward speeds and reverse, with nickel steel gears and shafts, the gears having .9375 inch face. The drive is jackshaft and double side chains to a dead rear axle. The chassis frame is a pressed steel channel section and is strongly reinforced. It is carried on semi-elliptic springs forward, 39.5 inches length and 2.25 inches width, and platform suspension at the rear with springs 45.25 inches length and 2.25 inches width. The front axle is a nickel steel I section with spindles 1.6875 inches diameter, and the rear axle is of the same material with spindles 1.9375 inches diameter. The wheels are 34 inches diameter, with 14 spokes, the forward tires being 34 by three inches and the rear tires 34 by 3.5 inches. The control is by a steering column at the left side, with clutch and service brake pedals and speed changing and emergency brake levers in the centre. The brakes are external contracting and internal expanding with 14-inch brake drums on the rear wheels. The turning radius of the wagon is 33 feet, especially adapting it for service in congested traffic.

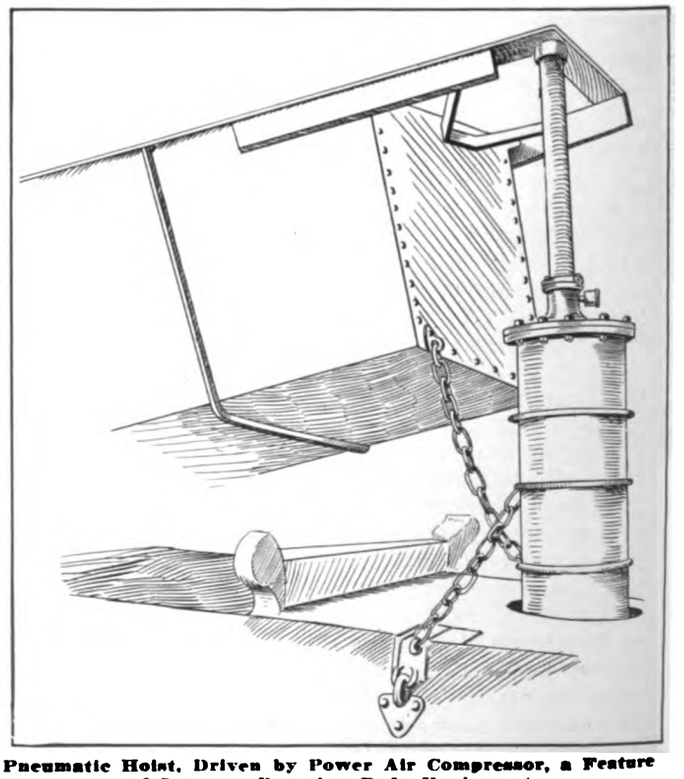
The New Chalmers.

The Chalmers light delivery wagon chassis is a model M pleasure car construction with adaptations that strengthen it for continuous service. The chassis frame is straight and longer and the springs are heavier, and the speed is reduced by gearing the motor four to one. The wheels are fitted with 34 by 5.5-inch pneumatic tires. The capacity is 1000 pounds. It is furnished with three types of body, an open express, or with enclosed body with curtains or panel sides. The open body has a load space 46.5 by 72 inches, and the close bodies have the same area with a height of 60 inches. The maker is the Chalmers Motor Company, Detroit.

Couple-Gear Vehicles.

Exhibited for the first time in the East were the Couple-Gear contractor's wagons made by the Couple-Gear Freight-Wheel Company, Grand Rapids, Mich., these being designed especially for haulage of heavy loads under conditions where ordinary power vehicles could not be used advantageously. Two were shown, the one being a Philadelphia dump cart and the other a bottom-dumping wagon. With these the wagon bodies are mounted on heavy dead axles and large wheels, these being fitted with steel tires. The wagon frame is extended forward of the bodies and the front wheels are replaced by the motor driven disc wheels peculiar to the Couple-Gear vehicles. In brief to the heavy wheel spindles are fitted electric motors each having a normal capacity of three horsepower. The armature shaft of the motor extends to the periphery of the discs forming the wheel, pinions at either end of the shaft meshing with racks integral with the discs. Outside of the discs is placed the wheel rim and the tire.

The energy is supplied by a battery carried under the seat of the driver. The control is by a lever, as is the electric street car, giving five forward speeds and five reverse speeds. As the motor revolves the pinions at the ends of the shaft turn in the racks and cause the wheels to revolve. As the pinions have nine teeth and the racks 240 it will be seen the reduction is 26.66 to one, this permitting the utilization of the power slowly and with an efficiency that is claimed to be 97 per cent. With this form of vehicle it is maintained that the pulling capacity of the motor is greater than its pulling power, that these wheels permit the use of standard wagon construction, that the large rear wheels minimize the tractive effort, can be drawn over road obstructions readily, reduce the vibration and can be used with better results in soft ground.



Pneumatic Hoist, Driven by Power Air Compressor, a Feature of Sampson Dumping Body Equipment.

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Steering the driving wheels always causes the tractive effort to be in the direction in which the vehicle is moving. The construction is not designed for speed, but for continuous work. About 90 per cent. of the load is carried on the steel tires. These carts are built with capacity from one to five tons. The same company builds all manner of trucks driven by four wheels, either by battery, or by battery that is constantly charged by a gasoline motor operated on the truck. It also builds tractors with gas-electric power plants that are fitted to draw loads carried on two large wheels with steel tires, these being another adaptation of the same principle of loading as has been described for the dumping wagons. The trucks are constructed to six tons capacity.

The control of these wagons is such that they can be handled by one not possessed of mechanical knowledge, the main requirement being judgment of speed and distance. As the load speed is about five miles an hour, and the maximum pace about seven it will be seen that speed is not an element of danger. Instead of the usual volt-ammeter is fitted the Sangamo ampere-hour meter which indicates zero on a dial with amperes as the scale unit when the battery is fully charged. As the battery is drawn upon the meter shows the exact energy remaining in the battery in amperes, and so at any time the condition of the power is shown. It is possible to reduce the battery to the capacity. The indication is not changed until the battery is charged when the dial will show the process of charging as it did discharging, and when the charging is complete the circuit is automatically cut off, so that the only operation necessary in storing the battery is to make the connection and leave the wagon.

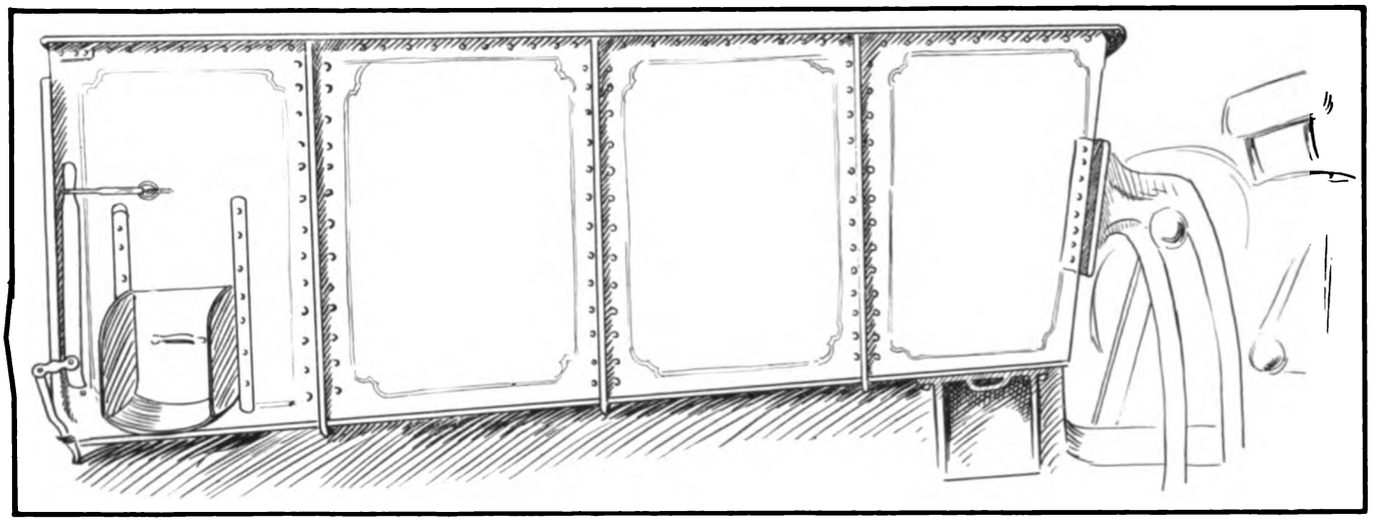
The wheels are accessible by hand holes in the outer discs so that the axle spindles, the bearings, the motor, the shaft, pinions and rack are convenient for examination or work. There is no other mechanism save the steering linkage and the steering column, and the driver has but comparatively little labor to perform. So far as simplicity and durability are concerned it is maintained that these vehicles may be used without regard to the ordinary attention given to motor driven vehicles.

The display was wholly for the benefit of those engaging in heavy haulage and was with regard only for those who have to do with a character of service for which the horses are even now considered to be best suited. It is possible, however, to employ these wagons for excavating and similar work. Incidentally the motors are of three horsepower each, making a total of six for the vehicle, but as these are capable of yielding an overload capacity of 300 per cent. for a limited period it will be understood that this equals 18 horsepower whenever that energy is needed.

Teel-Woodworth Display.

The Teel-Woodworth truck of three tons capacity was shown for the first time at a national exhibition and attracted much attention because of the practicality of the design and the substantial construction. The truck is built by the Teel Manufacturing Company, Medford, Mass., a firm that has produced animal vehicles for nearly a century, and which has in recent years devoted some of its activities to producing high grade automobile equipment. The company is widely known to the automobile industry, but only recently has it engaged in motor vehicle construction.

In producing the truck the designer has made no experiments. To the contrary he has combined elements produced by manufacturers of reputation, there being a Continental engine, for instance, a Hele-Shaw multiple disc clutch, a Cotta transmission, a Timken jackshaft, rear and front axle and brakes, a Ross steering gear, and a Mayo radiator, these being incorporated into a vehicle that has been created to afford a maximum of everyday service, to be operated with fullest economy.

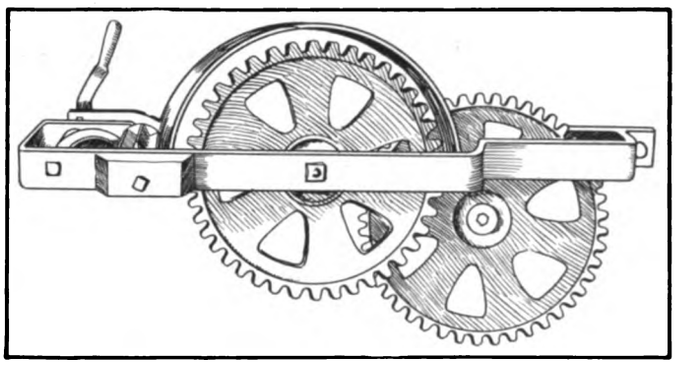


Monahan Body, Affording Forward and Rear Side and Rear Discharge, with Hand Hoist, Six Tons Capacity, Exhibited on Speedwell Chassis.

One of the objects sought was to eliminate many of the ordinary causes for delays, and to secure this every element that might be subject to derangement has been safeguarded. In other words the truck has been made as nearly fool proof as long experience would dictate was desirable or necessary. All the parts are jigged to insure perfect interchangeability, these being produced by one of the best known of the fine machine builders. All of these parts are carried in stock and may be obtained quickly. Practically all the bolts are of four sizes, standard thread, and these may be purchased in any good hardware store in the country. Every nut and bolt is cotter pinned, two sizes of pins being used, All the small pins and shafts are hardened and ground. The spring eyes are bronze bushed and should wear indefinitely, but the bushings may be replaced with slight cost. It is maintained that these qualities make for inexpensive upkeep and insure against delay.

The motor is water-cooled, with the cylinders cast in pairs, and is rated at 30 horsepower by the S. A. E. power standard. The water is circulated by a centrifugal pump and a fan driven by a belt. The radiator is of large capacity and the engine will not heat under any condition of operation. It is lubricated by a gear driven pump from a reservoir integral with the engine case that floods the

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Hand Lever and Gearing of the Power Hoist as Exhibited on an Alco Five-Ton Truck with Dumping Body.

engine bearings, and by splash. The carburetor is a float feed automatic type that will deliver a uniform gas at all times. The ignition is jump spark by a Bosch high-tension magneto with fixed spark. There are but five wires, four to the spark plugs and the other to the switch, and these leads are encased to protect them against wear and saturation by lubricant or moisture. The attention to the ignition system is minimized.

The Hele-Shaw multiple disc clutch has 28 discs and these are contained in a case that retains a sufficient quantity of sperm oil so that the discs are constantly lubricated. The clutch engages without harshness and it may be slipped continuously if desired without damage. The transmission is so designed that the gears are in mesh at all times and the speed ratios are secured by the movement of dog clutches between the gears. At high speed the gears are all idle. It is impossible to strip the gears. The speeds are three forward and reverse, with a maximum of 14 miles an hour, this being limited by the governor.

The jackshaft is with shafts 1.75 inches diameter and it is mounted on Timken roller bearings, that may be adjusted for wear, and which take the end thrust. The bearings are carried in the steel housing of the jackshaft. The drive is by double side chains. The axles are heavy steel drop forgings, the wheel spindles being fitted with Timken roller bearings throughout. The wheels are 36 inches diamter, with 36 by five-inch solid tires forward and 36 by four-inch, dual, rear. The chassis frame is a heavy steel channel section, with strong reinforcements. The springs are 45 inches front and 54 inches rear, half-elliptic, with the spring bolts case hardened and fitted in bronze bushings. The wheelbase is 125 inches and the tread 63 inches.

Control is by a vertical steering wheel with clutch and service brake pedals and a foot accelerator, there being no throttle lever. Side levers operate the transmission gearset and the emergency brake. The service brake has bands contracting on drums 14 inches diameter and three inches face on jackshaft, and emergency brake has shoes that expand within the 20 inches diameter on the rear wheels. These brake shoes are faced with Non-Burn. The gasoline capacity is 20 gallons with the tank under the driver's seat, and beside this is a separate tank that will contain two gallons of oil, the contents of which may be supplied to the motor by turning a petcock. The driver's seat is covered by a standing canopy that is supported by stanchions from the back of the seat and the radiator frame. The radiator is mounted on springs to nullify vibratory influences and it is protected by installation behind the strong front frame cross member. The dash and tail lamps are lighted from a storage battery.

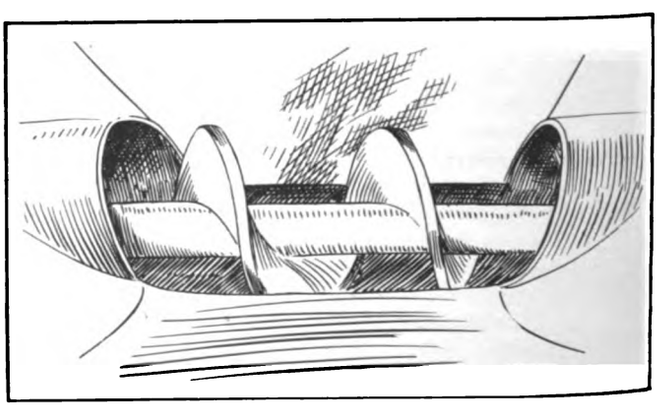
Koehler Delivery Wagon.

Of the delivery wagons of small capacity the Koehler machine, 1600 pounds capacity, was especially noticeable for the series of innovations, all of which had been combined with a view of obtaining extreme economy and endurance with minimum maintenance and upkeep cost. The chassis differs with present practise in that the motor is carried in a frame amidships, under the body floor, but it is accessible from the sides or by a trap in the body floor, while the position makes a very low centre of gravity, a condition of material importance in tire endurance. The purpose has been to produce a machine of low cost that would have moderate capacity and could be operated cheaply, the idea being that there was a large field for a vehicle that would be serviceable for light delivery and have such speed that it would be useful under practically all business conditions.

The engine is of the opposed type, with cylinders having bore of 5.25 inches and stroke of four inches, the power rating being 22 by the S. A. E. standard formula. The water jackets are large to secure efficient cooling under continued operation, they being cast integral with the cylinders. The cylinders are bored to size and ground and lapped to a finish. The pistons are turned, ground and lapped to size and, with the piston rings, are fitted with much care to secure complete compression. The crankcase is large and is designed with a view to obtain unusual lubrication. The engine has two main bearings, the forward one being 3.5 inches length and the rear 4.5 inches length, or a total of eight inches. The crankshaft is nickel steel, 1.875 inches diameter, with the crankpins 2.5 inches length, and a five-inch flange drop forged integral with the shaft. To this flange the flywheel is bolted. The connecting rods are of bronze, cast with a deep channel extending the length. The wristpins are of steel, ground, hardened and lapped. The camshaft is forged of tool steel, with the cams integral, and this is hardened and ground to a finish. The bearings are of the best babbitt metal throughout. The valves are 2.25 inches diameter, are mechanically adjustable and are interchangeable.

The cooling is by thermo-syphon circulation of the water through the large water jackets of the engine and the cellular radiator. Contrary to conventional practise the water inlet and outlet of the radiator are at the base, so that the heated water entering the radiator must rise through the coolest of the fluid, quickly reducing the temperature. No matter to what extent the water in the radiator may be reduced it will be circulated and cooled so long as there is a sufficient quantity to fill the water jackets and the piping system. The radiator is large and is suspended on helical springs to eliminate vibration.

The lubrication of the engine is force feed and splash in combination. There is a considerable oil reservoir in the base of the crankcase from which the oil is drawn by a gear driven pump and circulated through tubes, whence it is delivered in streams into the channels in the bronze con-



Screw Discharge of the Morgan Truck as Seen at the Bottom of the Hopper-Shaped Body, Power Being Furnished by the Motor.

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necting rods, through which it is distributed to the wristpin and crankpin bearings, and to the main bearings. The camshaft bearings, cylinder and piston walls, and the timing gears, are lubricated by splash. The oil is filtered as drawn from the reservoir. The ignition is by Bosch magneto located on top of the engine case that is driven by enclosed gears. The carburetion is by a float feed automatic carburetor.

The flywheel is mounted on the flange forged on the crankshaft and the engine is installed on forged steel hangers, so that it may be dropped out of the chassis very quickly and easily. The engine shaft is extended, with a single universal joint, to a combined transmission and jackshaft that is installed transversely in the chassis. The jackshaft case is a heavy oil-tight casting in which the jackshaft is mounted on very large journals. The transmission is planetary, all gears being of hardened chrome nickel steel, the shafts of hardened special alloy steel, ground to size, with bearings of phosphor bronze in semi-steel casings. The clutch bands for the low and reverse speeds are semi-steel, which cannot slip or burn, and the high speed clutch is a cone. The entire transmission is driven in an oil bath. The drive is by double side chains to sprockets on the rear wheels. The closeness of the sprockets materially reduces the length of the chain required.

The chassis frame is U shape, with the curved end at the front, where it extends considerably beyond the radiator, forming a solid and serviceable protection against damage from contact with an obstruction. This frame is with five cross members besides the engine and the jackshaft supports, being unusually stiff and strong. It is carried on semi-elliptic springs forward and full elliptic springs at the rear. At the forward end of the chassis, directly behind the radiator, is a cast metal footboard, which is bolted to the frame. Cast integral with this footboard is the base for the vertical steering column, the brackets supporting the clutch, brake and brake pedals, and the throttle linkage. The footboard stiffens the frame and makes certain the stability of the assembly. The steering gear is of the bevel pinion and sector type with a 16-inch hand wheel.

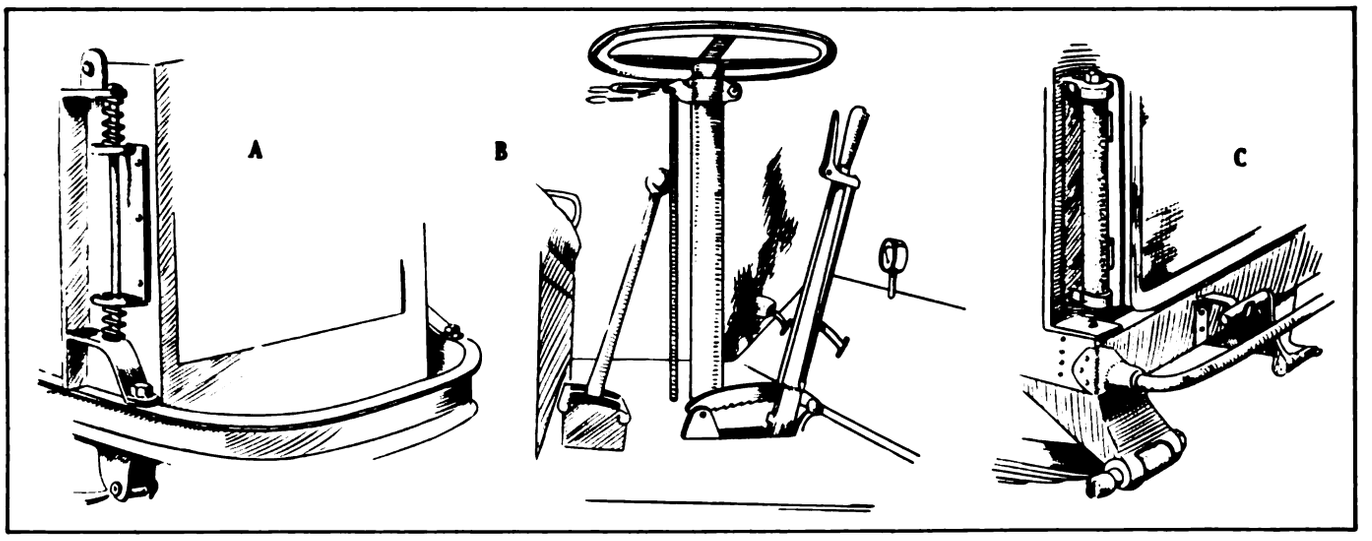
The front axle is a single steel forging 1.5 inches square, with the knuckle yokes integral. The rear axle is two inches square, forged from steel. The service brake operates on the jackshaft with braking surface of 75 square inches, metal to metal surfaces. The emergency brake is on drums on the rear wheels. The wheels are large and are fitted with solid rubber tires, two inches width. The wheelbase is 86 inches and the tread 56 inches. The drive is at the left side and the reverse and low speeds are controlled by pedals, with high speed clutch and the emergency brake operated by a single lever at the right of the driver. The fuel tank of 16 gallons capacity and the oil tank holding a gallon are located under the driver's seat. The maximum speed is 16 miles an hour. The weight is approximately 2000 pounds. The maker is the L. E. Schlotterback Manufacturing Company, Newark, N. J., for the H. J. Koehler Sporting Goods Company, New York City.

Poss Designed by Renault.

The Poss motor wagon, made by the Poss Motor Company, Detroit, was designed by Louis F. Renault, a French engineer of large experience, and it has in the engine a combination of qualities that are claimed to afford unusual power and longevity. The vehicle is friction driven, and simplicity and accessibility are features impressed upon the observer. The motor has four cylinders, cast en bloc, with bore of 3.5 inches and stroke of 4.75 inches, and is claimed to deliver 25 horsepower with 1200 revolutions. The water jackets are largest at the top and, with the exhaust manifold, are cast integral. The water intake is 2.5 inches diameter. The fuel header is integral with the block so that the incoming gas is heated by contact with the heated walls and carburetion is perfected. The water outlet manifold extends the length of the top of the cylinder block and has a main outlet with a Y with outlets 1.75 inches diameter. The manifold is attached to the block by four studs .375 inch diameter. The studs are threaded into plugs that are in turn threaded into the block, gaskets insuring a perfectly tight fit. The fuel manifold is unusually direct and fuel is uniformly fed to the cylinders.

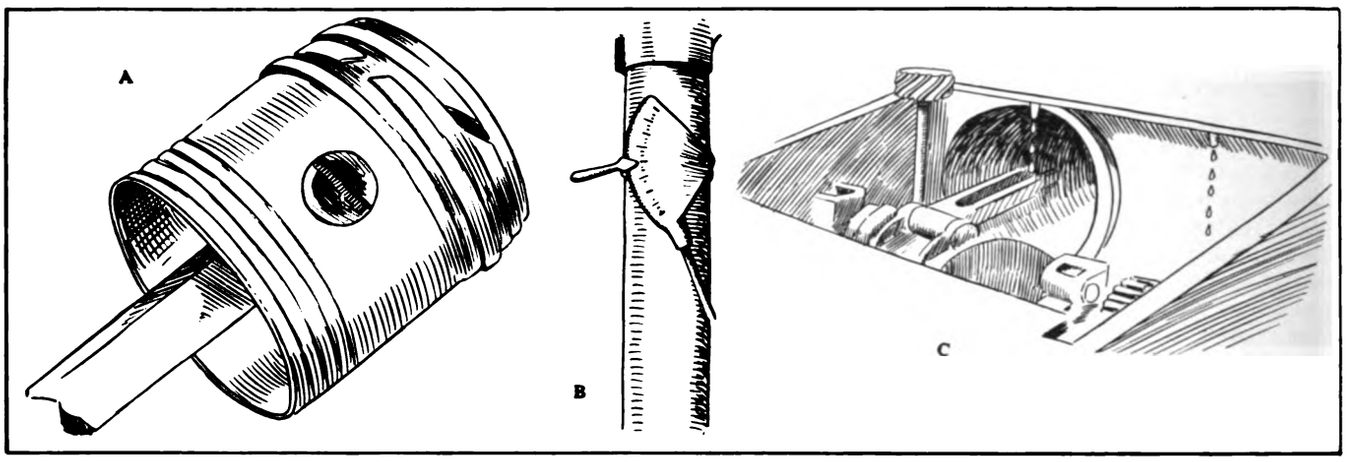
The engine block is cast from gray iron, and being of the T type the valves are at the right side. After boring the block is aged and then reamed and ground to size. The pistons are of the same material and are similarly treated in the making. They are fitted with three .25 inch rings above the wristpin and an oil ring near the base. Below the oil ring is an oil groove that is drilled at intervals of 60 degrees, through which oil collected by the ring is drained through the piston walls into the engine case. The engine case is a barrel shaped casting with the front web and the oil reservoir integral, there being a bottom plate that may be removed to afford access to the connecting rod bearings.

The crankshaft is a two-bearing type with bearings two inches diameter, the forward bearing being three inches length and the rear bearing four inches The shaft is of



Studied Simplicity and Stability: A, Koehler Radiator Suspension and Protection by Forming Chassis Frame with Side and Forward Members of a Single Piece of Metal; B, Separated Speed Change and Brake Levers of Clark Truck; C, Forward Spring Suspension, Radiator Carrier and Protector of Clark Truck.

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Mechanical Refinements: A, Mercury Piston with Wristpin Retained by Brass Pin Straightened in the End, Firmly Fixing the Pin in the Wall; B, Carburetor Air Valve Control on Dayton Steering Column; C, Mechanical Oil Feed to the Connecting Rod Channels of the Kochler Motor.

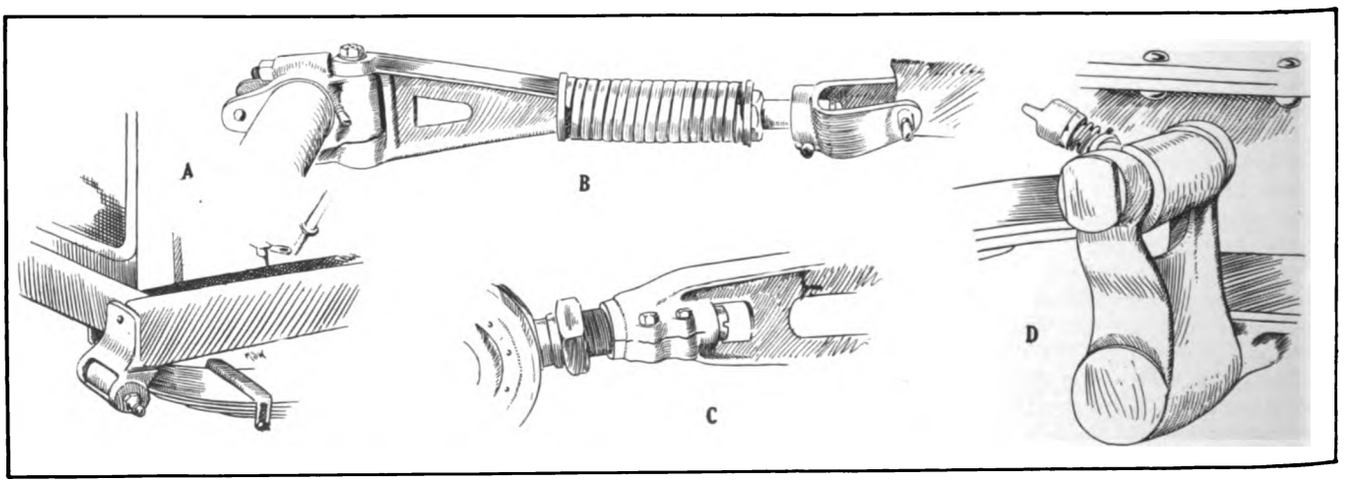
carbon steel, double heat-treated to insure strength. The crankpin bearings are .9375 inch diameter and 1.625 inches length. The bearings are the best grade of nickel babbitt. The timing gear is keyed to the crankshaft. The forward main bearing is pressed and pinned into the forward web of the crankcase, and the rear bearing is pressed into a removable plate fastened with eight .5-inch cap screws. The crankshaft is offset .375 inch.

Perfect alignment is obtained by the method of installing the bearings. Plates eight by 10 inches at the bottom of the crankcase permit work on or examination of the main engine bearings. The camshaft is a carbon steel forging with the cams integral and the three bearings are 1.75 inches diameter and the forward bearing, flanged to receive the timing gear, is three inches in length. The centre and rear bearings are one and 1.4375 inches length, respectively. The bearings are phosphor bronze and are adjustable for end play by a hardened steel washer and an adjusting lock nut. The cams have a .3125-inch lift. The camshaft timing gear is attached to a 2.875-inch flange by four .375-inch bolts, wired to prevent slackening.

The valves are 1.75 inches diameter, with cast iron heads electrically welded to stems .4375 inch diameter, six inches length and hardened at the ends. These operate in guides 2.625 inches length. The stems are slotted to receive the key retaining the large springs. The tappet rods are of tool steel, hardened and ground, 1.375 inches diameter wearing face, the upper end tapped for an adjusting screw into the head of which is inserted a gray fibre disc to eliminate noise. The rods are operated in .75-inch bronze bushings, with oil grooves to prevent lubricant working out above the bushings. The connecting rods are I section drop forgings, 9.5 inches from centre to centre, with oil holes drilled to the crankpin bearings. The crankshaft is removable from the rear of the case, the camshaft from the front. The timing gears are steel for the crankshaft, and iron for the camshaft and the magneto driving shaft, having inch faces. These are housed by a cover attached to the forward web of the case.

Lubrication is by splash from a constant level in the base of the engine case, large pockets supplying the crankshaft and camshaft bearings, the oil level being automatically maintained by feed from a reservoir cast integral with the crankcase. The cooling is by thermo-syphon circulation of water through the water jackets and the radiator, radiation being promoted by a fan driven from a pulley mounted on an extension of the crankshaft. Ignition is by a high-tension magneto with a fixed spark, the magneto being carried on a bracket cast integral with the engine case. The carburetion is by an automatic float feed carburetor. As there is a minimum of wiring and as the valve stems and tappets are enclosed by plates that are removable by winged nuts, the engine is unusually simple and clear.

On the crankshaft is installed the flywheel and bolted to the flywheel is a heavy steel arm. Behind this arm is a large clutch spring. This spring contacts with a flange fixed to the forward end of the driving shaft. This shaft is mounted in a large bearing carried on a heavy cross member, and on the rear end of the shaft is the driving disc, heavily webbed, 17.5 inches diameter. Between the flywheel and the rear shaft bearing is a universal joint. The cross member of the frame is strongly braced. Back of this cross



Spring and Torsion Rod Details: A, Stearns Forward Spring Horn; B, Velie Radius Rod and Adjustments; C, Stearns Provisions for Radius Rod Adjusting; D, Forward Shackle of Velie Rear Spring.

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member, and ahead of a second cross member, is the jackshaft, carried in heavy bearings. On this jackshaft is the driven wheel with a fibre face, that is moved transversely to any position, affording all the ratios of speed peculiar to roller or friction transmission. The drive from the jackshaft to the rear axle, which is of the semi-floating type, is by a single chain. The rear axle is 1.375 inches diameter and is housed by a tube 2.75 inches diameter, the differential assembly carrying the sprocket. The axle is supported by two truss rods, .4375 inch diameter and the axle relation is maintained by two steel radius rods .75 inch diameter, anchored to the rear spring saddles.

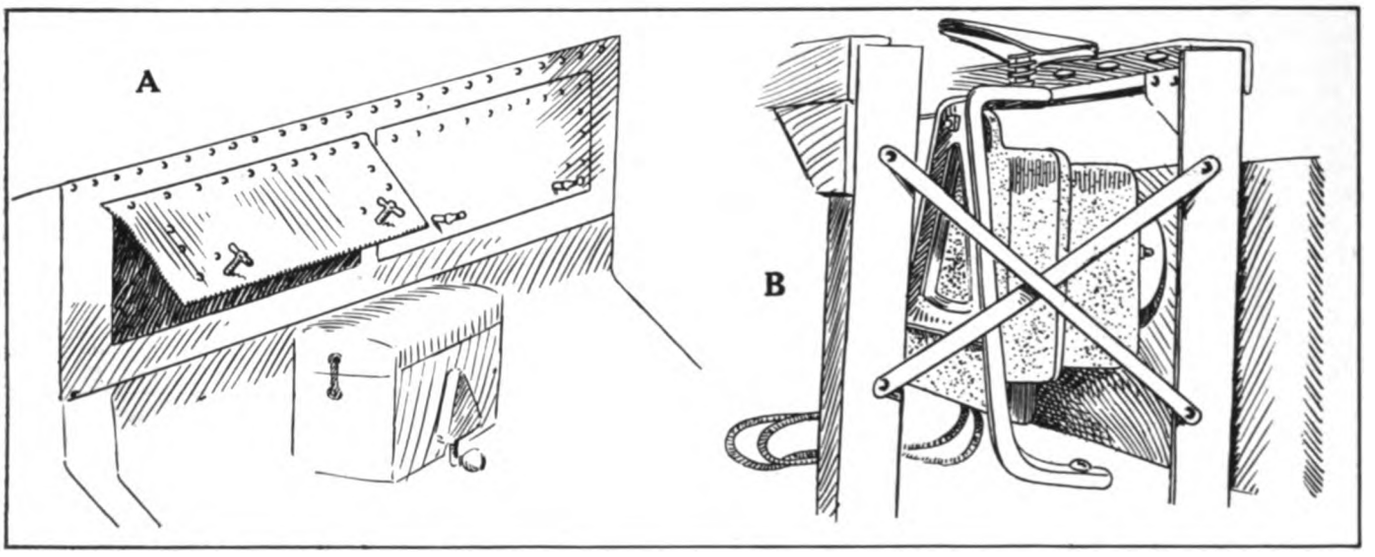
The chassis frame is a pressed steel channel section 135 inches length and with the two cast steel motor supports there are seven cross members, with triangular gussets at the rear end. The springs are semi-elliptic, the forward set being 36 inches length and 1.75 inches width, six leaves, perched off centre, with 20 inches spring length behind the axle centre. The rear springs are 45 inches length and two inches width, of nine leaves, shackled front and rear to eliminate driving stress. The front axle is a steel tube two inches diameter with drop forged nickel steel knuckles electrically welded to it. With pneumatic tires the wheel diameter is 34 inches, with tires 34 by 3.5 inches, and with solid tires the wheels are 36 inches diameter, with tires 36 by 2.5 inches.

The control is from the right side by an irreversible steering gear of the worm and split nut type, with a 16-inch wheel. The tiebar is before the front axle and is .75 inch diameter. The clutch is operated by a pedal and the service brake also is actuated by a pedal, the shoes of the internal expanding type being within drums on the rear wheels 12 inches diameter and 2.5 inches face. This brake is equalized. The speed is changed by a hand lever. There is a throttle hand lever on the top of the steering column. The wheelbase is 96 inches and the tread 56 inches. The capacity of the wagon is 1000 pounds. Under ordinary conditions three types of bodies are furnished with this chassis.

Mercury Delivery Wagon.

The Mercury delivery wagons, made by the Mercury Manufacturing Company, Chicago, Ill., are of 1000 pounds capacity. These are a type intended for hard service and to be operated with economy. The engine is with two cylinders opposed, mounted horizontally at the forward end of the chassis. The cylinders are cast with the radiating flanges integral, having a bore of 4.25 inches and stroke of four inches. The offset of the cylinders is 2.125 inches. The rating is 15 horsepower by the S. A. E. standard. The radiating surface of the motor is unusually large. The camshaft is mounted directly above the crankshaft, the cams being very large and contacting with large flanges on the ends of the valve pushrods. The valve stem guides are large and long, and instead of the usual helical spring the valves are operated by heavy springs with a single coil and ends spreading between the guides and the keys in the slotted valve stems. This removes the springs so far from the heat of the cylinders they are not affected. The crankshaft and camshaft are large in size with generous bearings, and the connecting rods are ample in proportions. The ignition is by a storage battery and dry cell battery, coil and timers.

The engine is lubricated by mechanical force feed to the main and connecting rod bearings, and by splash to the camshaft, camshaft bearings, timing gears, valve pushrods, wristpins, cylinders and pistons. The radiation is by a forced draft of air caused by the fan blades of the flywheel. The carburetor is a float feed instrument made by the Mercury company. The transmission case is bolted to the engine case, this making a unit power plant. The gearset is planetary, with disc clutch, all clutches and direct drive being secured through the use of a single lever, giving two forward speeds and reverse. The drive shaft is carried, with a single universal joint, through a stout torsion tube to the jackshaft and differential assembly. The jackshaft housing is large and there are liberal bearings. The drive is by double side chains to sprockets on rear wheels, mounted on a dead axle.



Convenience and Protection Considered: A, Tool Box Located in the Top of the Dash of Dayton Trucks; B, Suspension of the Ammeter in the Walker Delivery Wagon, Permitting Instant Removal.

The construction is such that the motor may be easily removed for work. The moving parts are encased and are operated in oil baths, being thoroughly protected from road accumulations. The chassis frame is of armored wood and is strongly reinforced. It is suspended on full elliptic springs, forward and rear. There are two sets of brakes, with internal expanding shoes faced with Thermoid, operated within drums on the rear wheels. The wheels are artillery type, 38 inches diameter front, and 40 inches diameter rear, with 1.75-inch solid tires on standard rims. The wheelbase is 85 inches and the tread 56 inches. The single lever operates the transmission, and the service and emergency brakes are actuated by foot pedals. The steering column is tilting and is located at the right side.

New Mora Design.

The Mora delivery wagon, made by the Mora Power Wagon Company, Cleveland, O., has 1500 pounds capacity. It has a horizontal opposed motor with bore and stroke of 4.5 inches, the cylinders being cast with the large water

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jackets integral. The rating by the S. A. E. standard is 16 horsepower. The water is circulated through large hose connections and an ample radiator by thermo-syphon movement of the fluid. The radiator is of the square tube type, and a draft of air is forced through it by the movement of the fan-bladed flywheel. The ignition is by a low-tension magneto and transformer coil, with a dry cell battery for starting and reserve. The lubrication is by mechanical force feed and splash, affording a liberal supply of oil under all conditions of operation. The mechanical oiler is operated by an eccentric on the camshaft and is located on the dash in sight of the driver. The carburetor is a float feed type, automatic in its action.

The driving system is carried through a mainshaft, with two universal joints, and to the transmission, which is located just forward of and bolted to the jackshaft housing. The assembly is such that the clutch, transmission and jackshaft are practically a unit. The transmission is a planetary type with the high speed clutch of steel discs. The gears and clutch operate in a bath of oil. In the jackshaft the differential is mounted on annular ball bearings, with outer ends being carried on large roller bearings. The drive to the rear axle is by double side chains. The chassis frame is of pressed steel channel section with six cross members. It is strongly braced and reinforced. This is carried on semi-elliptic springs. The chains are adjustable by the I section distance rods. The axles are special steel forgings, 1.5 inches square. The wheels are 36 inches diameter, with tires 36 by two inches forward and 36 by 2.5 inches rear.

The control is by an irreversible steering wheel located at the left side. The control is by pedals operating the low and reverse speeds and the service brake, and hand levers actuating the high speed clutch and the emergency brake. Both brakes are an expanding type with shoes having 2.5-inch face, operating with drums on the rear wheels. The ignition and throttle levers are mounted below the wheel on the steering column. The gasoline capacity is 12 gallons. The speed is 15 miles an hour. The chassis is furnished with standard express and stake type bodies.

The Ford Delivery Body.

The Ford delivery wagon chassis is the same as is built for the Ford touring cars and it is equipped with an enclosed body with weight capacity of 700 pounds. The driver is protected by a long extension of the top that extends beyond the dash, and by half sides, which permit him to see behind without difficulty should this be necessary. The drive is at the left and the control is the same as with the well known pleasure vehicles. The maker is the Ford Motor Company, Detroit.

Stanley Steam Wagon.

The Stanley delivery wagon chassis is practically the same as is built for the seven-passenger touring cars, its power plant being a 30 horsepower boiler at a steam pressure of 125 pounds, this type being of the same capacity as were installed in the famed Stanley racing cars. The engine is the standard Stanley construction. The wheelbase is 136 inches and the 36 inches diameter wheels are fitted with 4.5-inch pneumatic tires. Regular equipment is a standard express body and a passenger body seating 11 persons besides the driver. These are produced by the Stanley Motor Carriage Company, Newton, Mass.

Mais Is Little Changed.

The Mais delivery wagons and trucks were shown, these being without change, but noticeable for the internal gear drive at the rear wheels. Extreme endurance is claimed for these driving gears by the maker, the Mais Motor Truck Company, Indianapolis, Ind., it being maintained that they may be driven a million miles. One of the features of this machine is the governor which automatically controls the speed and cannot be tampered with. The tread is 58 inches, this being two inches wider than standard to prevent driving in car tracks and unnecessarily wearing the tires.

The Mais construction embodies distinct variance from conventional practise, there being the unit power plant, with the motor having four-inch bore and 5.25-inch stroke, so designed that it may be quickly removed from the chassis and replaced by another in the event of need. The transmission is automatically locked so that the gears cannot be shifted until the clutch is disengaged, and no inexperienced driver can strip or damage the gears. The brakes are unusually large, affording better protection in congested traffic and on hills. These brakes are positive in action and are easily adjustable. The drive is at the left hand, another quality making for easy control. When the requirements of the purchaser are known the gear ratio is determined and the governor is adjusted so that there can be no abuse of the machine.

Another claim is the economy of maintenance and upkeep. The frame is exceedingly strongly constructed and the drive is such there can be no strain upon the driving system, it all being taken by the dead rear axle and the unusually large radius rods, which centre just behind the forward universal joint of the drive shaft. Four of these machines of 3000 pounds capacity, were recently delivered to the United States War Department for service at Fort Leavenworth, Kan., for ambulance work.

Martin Tractor.

Aside from the service wagons exhibited there was shown the Martin tractor, which was included in the exhibit of Knox productions, with it being displayed a trailer with two large wheels with steel tires and an open-end body loaded with long lumber. This was demonstration of the possibility of hauling building material that could not be loaded on a truck.

Fire Apparatus, Etc.

There was an interesting display of fire apparatus, including five chemical hose wagons and two pumping engines. Of the combination wagons one each was shown at the Buick, Pope-Hartford, Kelly, Knox and Locomobile stands, and the latest Knox fire pump and the imported Saurer fire pump. Of these the Buick was a light wagon equipped with a small chemical tank and small hose. The other apparatus was of the type known as combination, combining the functions of the chemical engine and the hose wagon. The creations were all the most recent and decidedly advanced as to construction, arrangement and equipment. The Knox fire pump has a 90 horsepower motor, six cylinders, and a large piston pump with 900 gallons capacity a minute. The Saurer fire pump is 60 horsepower and is rated at 900 gallons a minute. The Saurer apparatus will hereafter be built at Plainfield, N. J. These machines came in for a great deal of attention and the show was visited by a considerable number representing communities, a number of orders being taken for vehicles similar to those shown. The fire pumps are adapted for the service in cities where the buildings are lofty, but the chemical wagons are intended for use mainly in suburbs and residential towns, where economy of time is more essential than large fire fighting capacity.

Ambulances were displayed by the General Vehicle Company and the Autocar Company, omnibuses by the Atterbury, Autocar, Kelly and Stanley exhibits, with a Kelly sightseeing wagon and a Knox patrol wagon.

Refinement of Details.

With every exhibit there was noticeable refinements and attentions to details that demonstrated that each designer has considered the chassis construction with a view to insuring endurance and strength and at the same time utilizing every condition that would convenience work and result in time economy. The Grabowsky, the Sandusky and the Garford machines are so constructed that the motors

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may be withdrawn from the chassis, the Sandusky without removing the radiator. With the others it is necessary to take off this member. The entire unit power plant is withdrawn with the Sandusky, but only the motor with the other two.

The radiator is mounted on spring supports by a large number of designers, this insuring against leaks that might be caused by rigid installations. The majority of the designers has constructed radius rods that are adjustable to compensate for the wear of the chains, otherwise known as stretching, and the manner in which each problem has been worked out is indeed interesting. With some of the trucks, as in the Locomobile, the jackshaft is mounted on spherical bearings, in gimbals, or in other construction so that the jackshaft is not affected by the distortion of the frame from road shock.

Chain cases are another detail that has received much careful study, these being designed to be oil and dust tight so that with occasional cleaning and replenishing of the grease there ought to be but little need of attention. The design of radius rods has been improved as a rule, these being heavier and with means for accurate adjustment. In several instances, notably with the Velie trucks, these are constructed with a spring buffer to absorb the shocks from road obstructions. The chassis frames are heavier and more strongly braced and in the Stearns truck, with a view to eliminating the stresses from vibration the motor has been mounted with the sub-frame carried in springs.

Because of the heavy duty required of the springs some designers have made hangers sharper in curve and deeper, to minimize possibility of striking when compressd to a limit, and to obtain freer action. Spring shackles have been very generally bushed with bronze and the spring bolts provided with means for lubrication. Brakes have been made larger and with equalizers to insure positive and certain action.

The placing of the tool box above the radiator in the dash before the driver is a convenience that can be appreciated by those who have been forced to search under a seat or elsewhere for tools that are absolutely necessary for the simplest adjustment. Another installation on the same machine is a little hand lever in a quadrant on the steering post by which the gasoline supply may be varied when there is need of giving the motor more fuel, such as during a hard climb or where the work is extremely hard, this being necessary with a long stroke motor.

The Mercury piston construction was noticeable for the simple manner in which the wristpin is retained. The channel in the boss for the wristpin is bored and at either side a small recess is made. The ends of the hollow wristpin are cut with a semi-circular recess to correspond with that in the side of the boss. The wristpin is placed with the recesses registering and then a brass pin is placed into them. This pin is bent when inserted, but by applying pressure it is straightened, the increased length filling the recesses and firmly fixing the wristpin. The brass pin is even with the walls of the piston and there is no possibility of the wristpin becoming loose, and the brass will not score or damage the walls of the cylinders. The process is inexpensive and the construction is regarded as being satisfactory, mechanically.

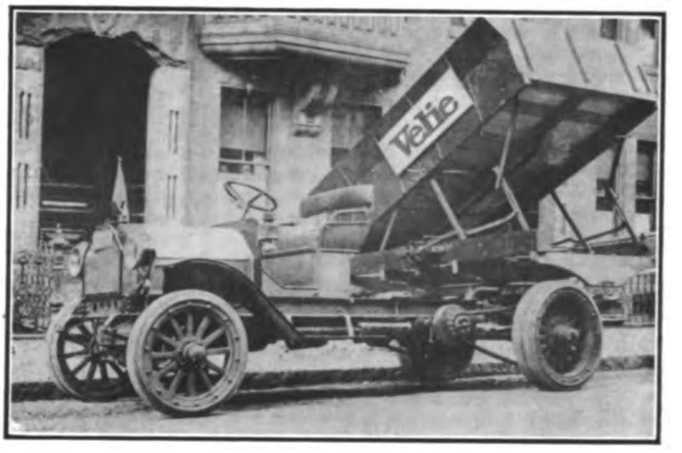
EDISON STORAGE BATTERY LETTERS.

Some 18 months ago, the Edison Storage Battery Company, Orange, N. J., began a distinctive educational campaign in the Army and Navy Journal, in which Miller Reese Hutchinson prepared a series of 52 letters, explaining in simple and non-technical language the methods of construction and operation of the Edison storage battery for commercial and pleasure vehicles. Those who have had opportunity to read but one or two of these letters have become imbued with the highly instructive material embodied therein, and the company has been besieged with inquiries as to how the full set might be procured. So insistent has been this demand that the Edison company has prepared, in reprint form, a neatly bound volume, over 100,000 copies of which have been distributed already. The letters are replete with information concerning this remarkable product and the treatment is such as to meet with decided approval by the general public. Mr. Hutchinson has been engaged to prepare a new set of letters, which will appear weekly in many journals throughout the country, and it is anticipated that they will be received in the same manner as his initial effort.

NEW VELIE DUMPING BODY.

A new type of dumping body has been brought out by the Velie Motor Vehicle Company, Moline, Ill., one of which has been fitted to a three-ton Velie truck and is being demonstrated by the Boston branch of the company. In the accompanying illustration is depicted the design and it will be noted that the carrying receptacle has been elevated and swung to the desired position by means of a roller bearing turntable.

This arrangement not only facilitates the unloading of



New Velie Dumping Body Which May Be Elevated to Any Angle and Swung in a Circle by Means of a Turntable.

coal, sand or brick, but eliminates wear and tear on the machine. Many times the driver will back up to and over the sidewalk to get his load into proper position for dumping. This creates considerable damage to the tires as well as to the mechanism of the car.

The new body is mounted on cross sills, these being attached to the upper part of the turntable mechanism, which is so constructed that the load may be swung easily to the desired location. The carrying receptacle is elevated to any angle by means of a hand operated winch. One of the features of the design is that it does not obstruct traffic in the street as it is parallel with the road and the sidewalk and does not extend into the former.

PENSACOLA ADOPTS MOTOR SPRINKLER.

In Pensacola, Fla., the warm climate makes it necessary that the streets be sprinkled frequently. The authorities decided recently to dispense with the horse drawn equipment and placed an order with the Autocar Company of Ardmore, Penn., for an automobile on which will be installed a cylindrical tank capable of carrying 300 gallons of water. The container is to be fitted to one of the commercial chassis and will be mounted upon sills to distribute the load evenly.

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NEWS OF THE COMMERCIAL VEHICLE INDUSTRY.

Sells Taxicab Business to Develop Motor Omnibus Interests Along Broader Lines--New Companies Organized and Old Concerns Increasing Activities.

Changes in the taxicab situation in New York City have been predicted freely during the past year, and while many of the reported combinations and readjustments have failed to materialize, it is interesting to note that the New York Transportation Company has sold its taxicab business to the Connecticut Cab Company of that city. The purchasing company will take possession June 1, adding to its already well equipped line, more than 600 cabs, the stations and good will of the former concern. The statement of W. R. Meade, president of the New York Transportation Company, in this connection, follows:

"Since the adoption of the motor omnibuses on Fifth avenue, that branch of this company's business has developed with amazing rapidity. We have for a long time felt the necessity of concentrating our efforts on the Fifth avenue omnibus line, for the benefit both of the stockholders and of the public. Such concentration was manifestly impossible with the attention of the board divided between the omnibus line, the taxicab and livery business.

"On the other hand, we awaited an offer for our taxicab and livery plant from a concern that should not only be advantageous to our stockholders, but that should come from an organization able to maintain the high standard of service which our taxicab customers have come to expect from us.

"While I do not care at this moment to go into particulars as to our arrangement for the development of the Fifth avenue omnibus business, I am willing to say that the improvements made there will, we hope, within the next few years be even more important and noticeable than the change from horse to omnibus traction. The advantages, both to the stockholders and to the public, will be marked and important."

TO PRODUCE PARCEL DELIVERY VANS.

The growing importance of light delivery vehicles has brought out a number of new concerns for their manufacture during the past few months. Among the latest is the Manistee Auto Company, Manistee, Mich., which has been organized by seven local men with a capitalization of $51,000. Charles Elmendorf is president and general manager, and George M. Burr, secretary and treasurer. Suitable machinery has been purchased and work will begin in the near future on the reconstruction of a plant at River and Fifth streets, where low priced runabouts and parcel delivery vans will be manufactured under the present plans.

WOULD LOCATE IN SPRINGFIELD.

It would appear that Springfield, Mass., is to become an important distributing centre for motor trucks, if the reports from that city are verified by subsequent developments. It is announced that representatives of the General Motors Truck Company were in Springfield recently, seeking to interest local capital in the organization of a company with capital of $300,000 for the erection of a modern distributing plant, which should have charge of the disposal of the product of this concern in the New England states.

According to this information the representatives interviewed officials of the Morse-Readio Company, a local concern engaged in the manufacture of pleasure and commercial lines, which has been contemplating the construction of a new building on the east side of Dwight street. The proposition is said to have included a combination between the two companies in the organization of the distributing concern.

With the western men were two Boston architects who exhibited plans for a six-story structure, the first floor of which was to be utilized as a large automobile supply store. The second and sixth were to be reserved for the distributing business of the new company, the third for pleasure vehicles, with an entrance from Chestnut street, and the fourth and fifth for storage purposes.

WILL COMBINE FORCES.

Announcement is made by Henry F. Donaldson and Joseph Tracy, both of New York City, that they have associated themselves as automobile engineers to undertake consultation, research and development work, design and construction, laboratory and road tests. Both men are well known in the industry, Mr. Donaldson being president of the Society of Automobile Engineers, and Mr. Tracy a consulting engineer of wide experience. For the present, headquarters will be maintained in the office already established by Mr. Tracy at 118 West 39th street, and the laboratory in New Jersey will be retained.

EXPLOITING CINCINNATI TRUCK.

The drawings, patents, equipment and material belonging to the Power Car Company of Cincinnati, O., have been purchased by a concern to be known as the Cincinnati Motors Company. The new owner will be incorporated in the near future, and will take immediate steps to place in the market the car originally designed by the Power Car Company, under the name of the Cincinnati truck. Those behind the movement include Franklin Alter, Harry T. Alter and J. B. Doan, all of Cincinnati.

TO PRODUCE CARS IN ST. JOHN.

J. A. Pugsley of J. A. Pugsley & Co., St. John, N. B., was a visitor at the recent Boston show for the purpose of interesting capital in an effort to locate an automobile factory in St. John. It is understood that he was more or less successful and plans are under way for the erection of a plant, in order that construction work may be begun with at least 500 workmen in the early summer. Besides pleasure cars, the new concern will specialize in the construction of taxicabs for which there is said to be an unusual demand in New Brunswick.

ENLARGING CHASE PLANT.

Construction work will start in the near future on an important addition to the plant of the Chase Motor Truck Company, Syracuse, N. Y., maker of Chase commercial vehicles. The business of the concern has increased materially as the result of recent shows in various parts of the country, and many of the new orders call for special bodies on standard chassis. In order to handle this extra work an additional story will be added to the main building.

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COLORADO WOMAN BECOMES TRUCK MAKER.

Probably the first woman in the country to direct the production of motor vehicles, no matter what the type, is Mrs. Nettie C. McIntyre of Denver, Col., who is not only the organizer but principal stockholder in the Wichita Falls Manufacturing Company, Wichita Falls, Tex., maker of the Wichita Falls truck. Mrs. McIntyre is a practical business woman, who has had large experience in other lines of endeavor, and her interest in the manufacture of commercial motor vehicles is due largely to the fact that she realizes the importance of this type of transport in solving many of the difficult problems of modern haulage in all sections of the country.

Until recently her home was in northern Colorado. While on a business visit to Wichita Falls she became directly interested in a unit control of spark, throttle, clutch and transmission, invented by C. A. McKiernan of that city. She believed that this feature would be particularly applicable to motor trucks and enlisted the financial support of J. A. Kemp and Frank Kell, both of Wichita Falls, in her project.

As a result of her endeavors the company was formed and a few vehicles of one and two tons produced in time to be displayed at the recent Kansas City show. Their success seems to be assured, from the fact that orders for 25 machines were secured during the exhibition.

The Wichita Falls truck was next displayed at the Denver show last month, and proved to be one of the chief attractions at the so-called Rocky Mountain district exhibit. The Wichita Falls Motor Sales Company has been organized in that city to look after the retail business in Denver and vicinity.

DECATUR TRUCK IN NEW HOME.

The Grand Rapids Motor Truck Company, which is the new name of the Decatur Motor Truck Company, maker of Decatur "Hoosier Limited" vehicles, is now located in its new home on North Front street, Grand Rapids, Mich., where the machinery and other equipment removed recently from the old plant in Decatur, Ill., is being installed as rapidly as possible. The change nowise affects the mechanical construction of the car, which has made such an enviable record during the past year that enlarged facilities for production were absolutely imperative.

The new company is capitalized for $600,000, and among the additions to the directorate are several prominent business men in Grand Rapids. M. E. Brackett remains at the head of the organization, and it is understood that the general policy of the company will be unchanged, except in the matter of greater production. In other words, the change was made solely for the purpose of broadening operation.

RECIPROCITY IN NEW JERSEY.

After once deciding by a majority of two votes that it would not adopt the so-called reciprocity measure, the Senate of New Jersey changed its mind, and the bill now awaits the signature of Governor Wilson. Of chief interest to the owners and operators of motor trucks is the provision of an additional fee of $10, over and above the registration fee which is based on horsepower rating, for commercial vehicles weighing unloaded more than 4000 pounds. This section is based on the contention that heavy freight vehicles wear the roads much more than other types. The reciprocity portion of the act follows:

"Any motor vehicle belonging to any person who is a non-resident of this state and who has registered such motor vehicle and has complied with the law of the state, territory or federal district of the United States in which he resides with respect to the registration of motor vehicles and the display of registration numbers, and who shall conspicuously display such registration number as required thereby, may be driven in this state during a period not to exceed 15 days in each calendar year, or on two or more occasions not exceeding in the aggregate the period of 15 days in any such year, without complying with or being subject to the provisions of sections 15 or 21 of the act to which this is a supplement, or either of them, or with any of the preceding sections of this supplement; provided that each day or part of a day during which any such motor vehicle is within this state shall be considered as one of the said 15 days; and provided, further, that the provisions of this section shall be operative as to any such motor vehicle owned by non-residents of this state only to the extent that under the laws of the state, territory or federal district of his residence substantially similar exemptions and privileges are granted to motor vehicles duly registered under the laws of this state."

MILLION DOLLAR ELECTRIC CONCERN.

Articles of incorporation have been filed with the secretary of state at Albany, N. Y., by the Buffalo Electric Vehicle Company of Buffalo. The capital is stated to be $1,000,000, of which $700,000 is to be common stock and $300,000 preferred. The company is to manufacture electric pleasure and commercial cars.

The directors named are: W. C. Feuchter, W. J. P. Seipp, Thomas B. Wheeler, Frank G. Lane and Marcus A. Alexander, all of Buffalo. It is announced that the complete details have not been worked out, but it is expected that the company is to be a merger of five existing Buffalo concerns, not necessarily now connected with the automobile industry.

WILL MAKE TRUCKS IN TEXAS.

The Twyford Auto Manufacturing Company has been organized in Houston, Tex., with capital of $400,000, for the manufacture of a four-wheel drive truck under the Twyford patents. Nearly 30 acres of land have been purchased at South Houston, this being located on the railroad line and close to the depot at that point. Work will begin at once toward refitting the building thereon for the production of mechanical vehicles, although no announcement is made as to the number of types or sizes.

The officers and directors include some of the most successful business men in that section, as follows: President, Monta J. Moore, president American Trust Company, Houston; vice president, J. N. Groesbeeck, director Hardy Oil Company, Houston; secretary and treasurer, Monta J. Moore, Jr., Houston; superintendent, R. E. Twyford, South Houston; directors, F. M. Robinson, automobile business, Houston; W. E. Richards, president American Loan & Mortgage Company, Houston; W. C. Berry, attorney San Antonio & Arkansas Pass Railroad Company, San Antonio.

FACTORY TO LOCATE IN JERSEY.

While the name of the purchasing concern has not been made public, it is understood that a new automobile factory is to locate in Garfield, N. J., a title to 16 acres of land in the section known locally as Plauderville, having passed from Matthew Van Kirke to August Hensel, who is acting for the real buyers.

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JOHN N. WILLYS TAKES OVER GRAMM PLANT.

Undoubtedly one of the most important automobile deals of the past few months is disclosed in the announcement that John N. Willys of Toledo, O., president and sole owner of the Willys-Overland plants and allied interests, has bought the controlling interest in the Gramm Motor Truck Company, Lima, O., maker of Gramm vehicles. This news comes as a decided surprise to the industry, although it has been known in a general way that Mr. Willys has been casting about for a truck plant that was equipped as he thought it should be to meet the requirements of the commercial car users of America, and particularly of the more than 2000 Overland dealers.



John N. Willys, President Willys-Overland Company.

The combination appears to be ideal from many viewpoints. The remarkable rise of Mr. Willys in the automobile business since he took over the Overland plant has been a subject of much interest both in and out of the industry. B. A. Gramm is without doubt one of the best informed and most experienced truck manufacturers in the country. His company was among the first to undertake the solution of the body problem, and this feature alone is a business in itself.

The Gramm truck plant is one of the largest in the world, devoted exclusively to the manufacture of commercial cars. The buildings occupy 22 acres of ground, and 6.25 acres are under one roof. Twelve hundred men are employed. All of the equipment is of the very latest and best that can be purchased. The automatic machinery is the most modern. The buildings are of steel and reinforced concrete, and are valued at $1,250,000. No announcement has been made concerning the plans of the Gramm company under the new management.

KELLY-SPRINGFIELD TIRE EARNINGS.

The Consolidated Rubber Tire Company, Akron, O., maker of Kelly-Springfield tires, reports that the net earnings of the company for the year 1911 were $114,020, an increase of $28,505 over the previous year. The gross sales for 1911 were $3,383,532, as against $2,160,915 for 1910. The income account for the two years is shown by comparison as follows: Interest, dividends, etc., $95,562 in 1911, and $150,402 in 1910; total receipts, $2,479,094 and $2,311,317, respectively; expenses, taxes, etc., $3,365,074 and $2,225,802, respectively; net earnings, $114,020 and $85,515, respectively.

GOODYEAR BRANCH IN MEXICO.

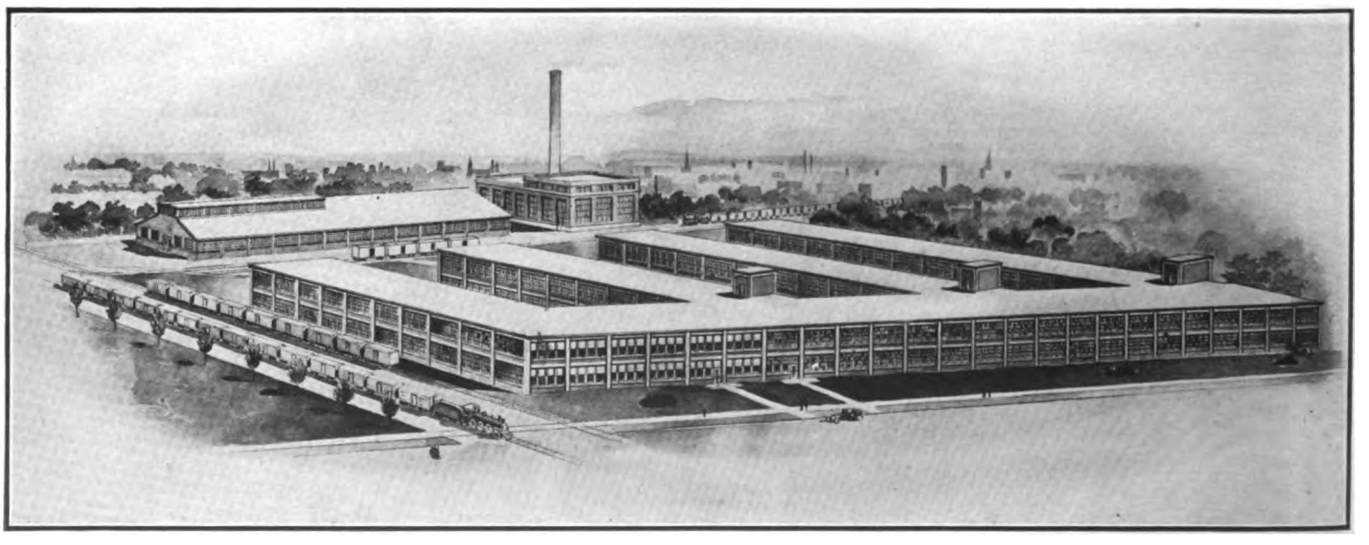
The Goodyear Tire & Rubber Company, Akron, O., maker of Goodyear tires, has leased for a long term of years a three-story building at the corner of Avenida Juarez and Balderas, Mexico City and the structure is being remodelled to serve as a special factory branch in Mexico. The officers of the Mexican company are: Director general, J. C. MacFadyen, formerly in charge of the company's branch in Indianapolis, Ind.; secretary and treasurer, S. F. Fuller, formerly with the Mexican Clay Products Company.

GRANT TRUCKS IN BOSTON.

The Grant Motor Truck Company has been organized in Boston, with Harry F. Grant, twice a winner of the Vanderbilt Cup race, as treasurer, and Frank S. Corlew as sales manager. It is announced that the factory will be located in Cambridge, Mass., where a one-ton vehicle will be produced, capable of carrying at least 50 per cent. overload. Temporary offices have been opened in the Shoe & Leather building, Boston.

AIRLESS TIRES IN ALLIANCE.

The Board of Trade in Alliance, O., announces it has procured for that city the plant of the Davies Manufacturing Company of Detroit. The concern produces airless automobile tires, and is incorporated for $150,000.



Plant of the Gramm Motor Truck Company, Lima, O., the Controlling Interest in Which Was Acquired by John N. Willys, Recently.

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MULLER POWER CAR AND ROAD TRAIN.

Interesting Application of Mixed Gasoline-Electric System in Hauling Heavy Loads Long Distances Over All Conditions of Road Surfaces.

By Joseph P. Fox.

THOSE interested in the matter of transporting heavy loads through districts where it has been found impractical to construct railroads are aware of the importance of the motor road train, but there have been certain difficulties in the production of suitable vehicles which at first appeared almost insurmountable. Differing types of power, steam, gasoline and electricity, have been tried, and it has been demonstrated very effectually by experience that the main feature is not so much that of the power generator, but the means for transmitting this power to the road wheels.

The real advantage of the road train lies in the proper division of the weight to be carried over a large number of wheels, and of having as many of these wheels as is possible act as driving members, thus doing their part in the work of propelling the whole. It is in unity of action that the greatest efficiency of the road train is realized.

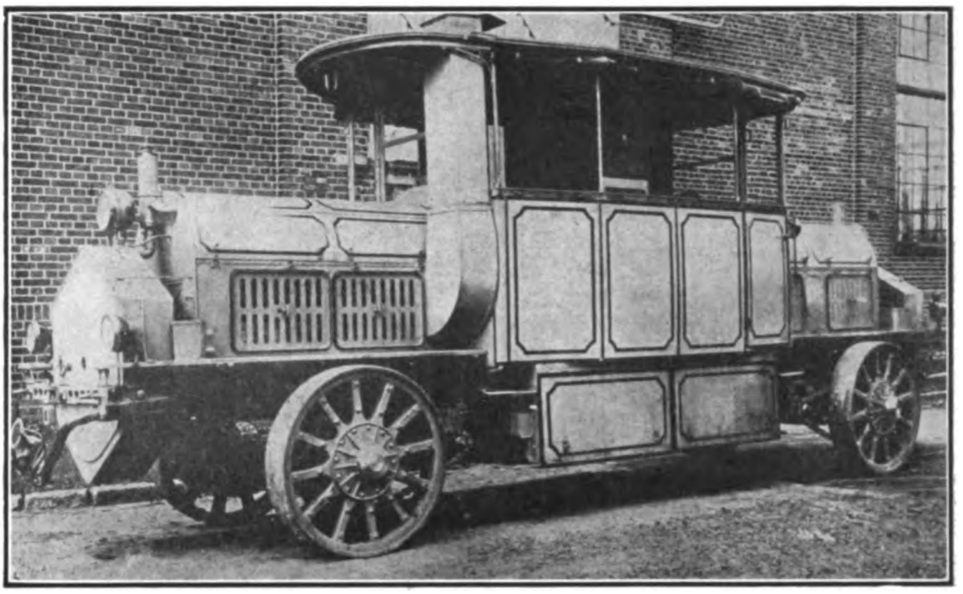
Even in countries well served by railroads, there are sections, towns and cities lying between and on hills, which in many instances offer splendid opportunity for the institution of such service as is contemplated by the road train. It is of particular advantage, however, in the transportation of mining products and supplies; timber, stone, cement and other building materials, and in the great food growing centres where quick movement of large quantities of produce is of the most vital importance.

Of course, if the road train is to supplant present methods, it must possess positive operation, sufficient to guarantee against extended delays which could cause serious inconvenience or loss. In addition, it must be able to transport goods or material at a cheaper rate than the means for which it is offered as a substitute. It is easy to understand that such a train is confronted by serious handicaps, and among these may be mentioned hills, bad roads, curves and corners, the last named of which must be taken within a comparatively short radius.

In fact, it may be stated that it is in the matter of rounding curves and corners in which the constructor has found the greatest difficulty of all. Each car, or each member of the train, must have the ability to describe automatically the same arc of a circle as the leader without any extraordinary skill or particular attention on the part of the driver, other than that usually required in turning corners with a single vehicle. In other words, the entire train must act as a unit. It is interesting to note, in this connection, that a number of road trains have been produced, which have demonstrated their ability to do this. It will be seen that it is necessary that when four wheels are used for each car, they shall all be steering wheels and if possible driving members as well.

By dividing the load over a number of cars and therefore over a large number of wheels, it is possible to operate over sandy roads or soft ground without sinking too deeply. If one set of wheels were loaded more heavily than the others they might sink into the path so as to make driving very difficult, if not impossible. Furthermore, a proper distribution of the load insures that each set of wheels shall have sufficient adhesion to the road surface at all times, even though some may be in such position on bad or slippery ways as to be of practically no service for the time being.

To obtain the best results, therefore, it becomes necessary above all things to have the best possible means of transmitting power to the driving wheels. It must appear that it hardly would be practical to have a separate power generator in each car, as this would require too much attention and take up altogether too much valuable space. As a result, the trend of design has been confined principally to a central power plant with a simultaneous transmission of power to the various driving wheels.

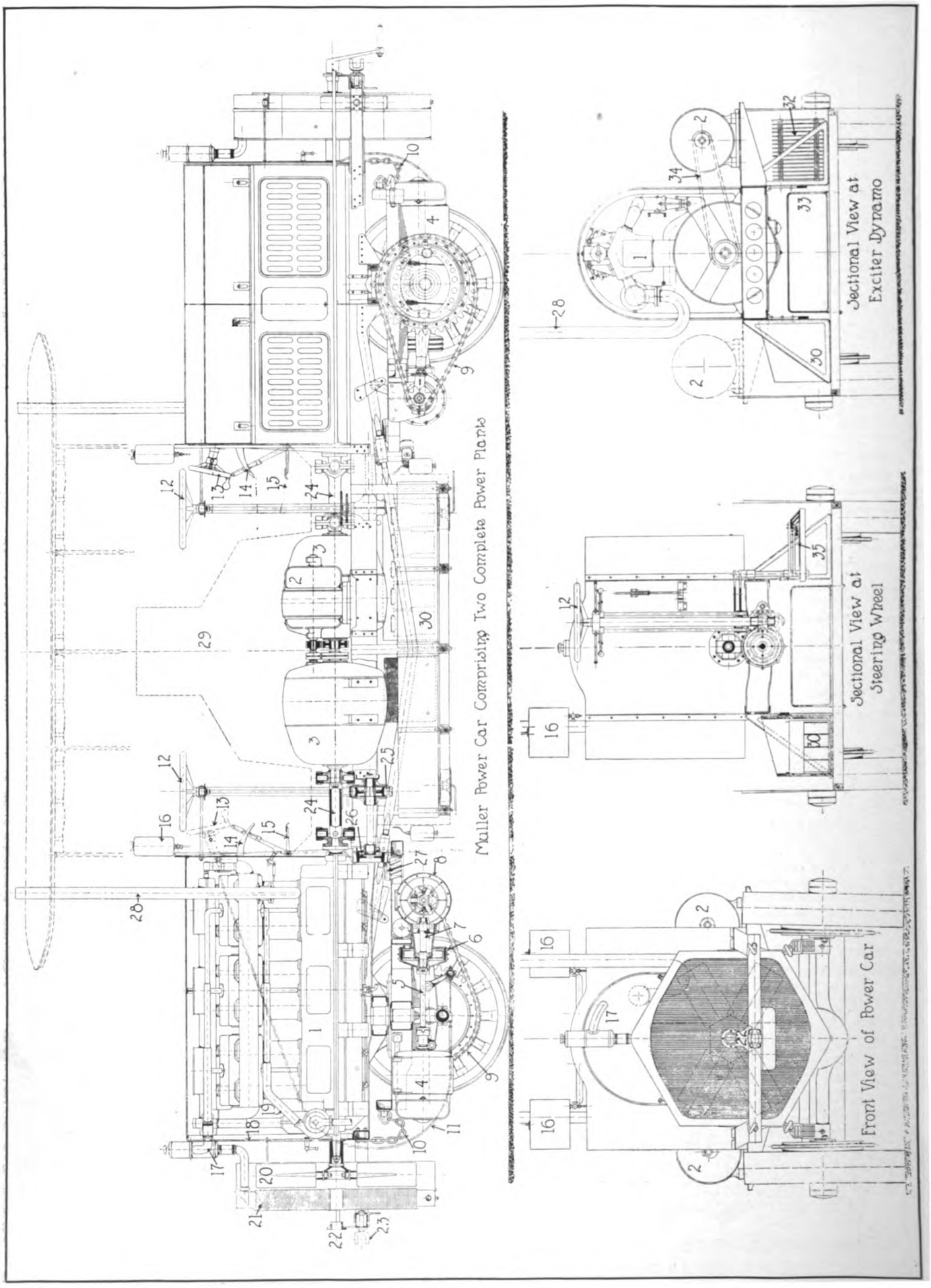


Complete Muller Power Car with Its Double Power Plant, Elevated Exhaust Pipe, Iron Tired Wheels, Etc.

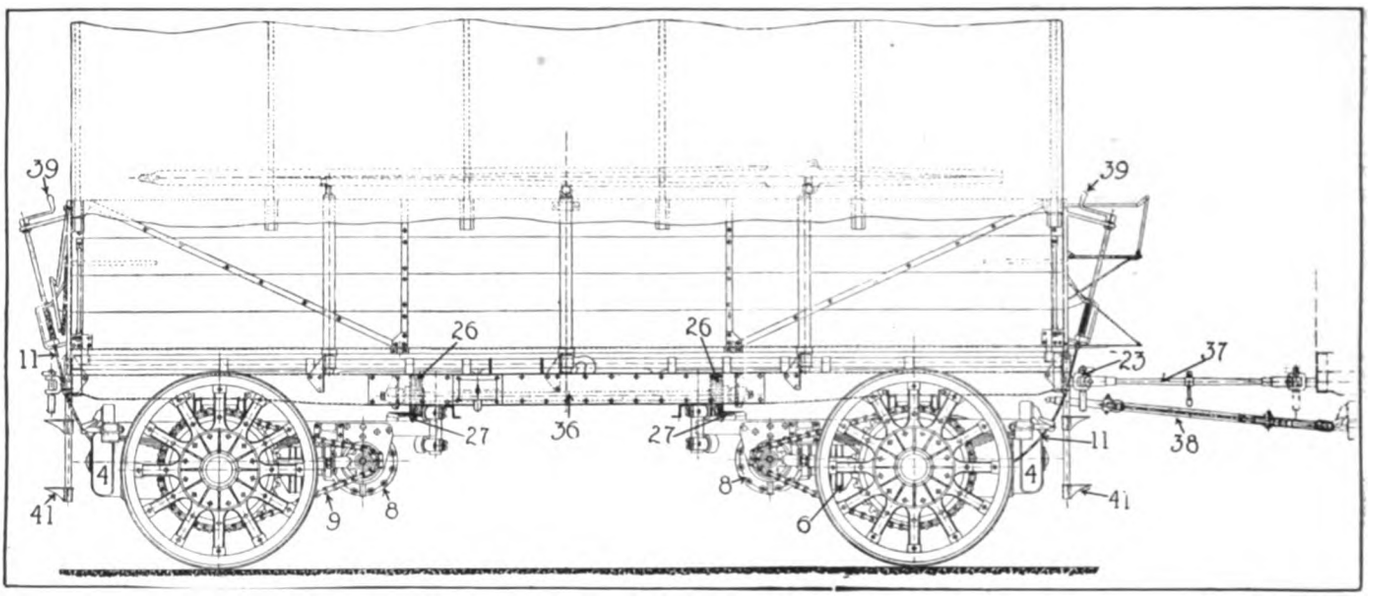
As power generators, either the steam boiler and engine or the gasoline motor may be used, and as a medium of power transmission to the wheels, either electricity, compressed air or oil hydraulics would appear to be better qualified for this work than any mechanical means. Instead of power generators, it is possible that compressed air tanks or storage batteries might be employed, but this hardly would be practical, except for regular trips over short distances and under specially favorable conditions for refilling the tanks or recharging the batteries.

The generation of power by gasoline motor and the transmission of this power by means of an electric dynamo and driving motors, seems to have exceptional qualifications not possessed by other systems. This so-called mixed system has been tried with success in the construction of single vehicles, and it must be added that it is as near

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Side View of Muller Utility Car, Showing Relation of Parts and Method of Connecting in Making Up the Train.

ideal theoretically as can be imagined, especially with road trains. There is ample space for the assembly of the dynamos and reserve batteries, which do good service as well in lighting the car and in starting the motors. The transmission of energy to the distant cars being by the simple means of a cable, which is not in any way sensible to shocks, twists or differences of temperature, is an advantage of great importance peculiar to this system.

There is perhaps no service for which the trackless train is better adapted than military work, and here this so-called mixed system has been proven practical by severe tests under all conditions and over all kinds of roads. The wonderful elasticity and reserve power, as well as the quick and simultaneous transmission of power to all driving wheels, has made it possible to overcome road conditions that otherwise would seem to be impassable.

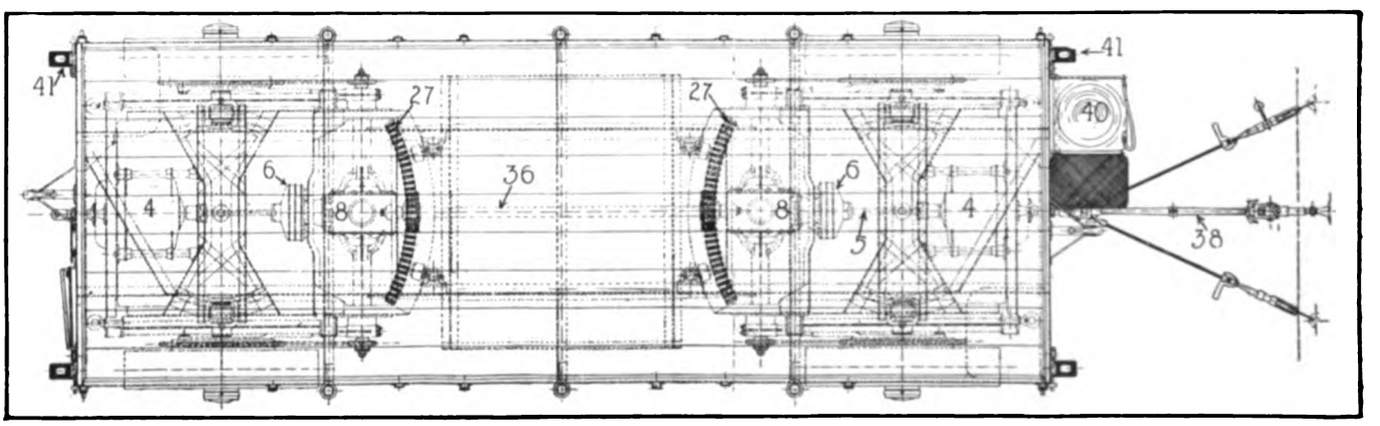
The war departments of various European countries from time to time have experimented with the road train, and the encouragement offered to the manufacturers has been of great assistance to the industry. This is particularly true of Germany, which has established an experimental corps composed of what are termed "Genius Soldiers," for the purpose of thoroughly testing out everything worthy of note which is brought to the attention of the government. Suggestions for improvement and for new construction are made by this department, subsidies and prizes are granted to those who have qualified; in fact, everything possible is done by the government to encourage progress along these lines and to keep the war department abreast of the situation. This applies to every line of activity.

The road train described herein is that of the firm of W. A. Th. Muller (Strassenzug Gesellschaft) Street Train Company, of Staglitz, near Berlin, and was built especially to comply with the requirements of the German War Department. It is composed of one power car and six trailers, the entire train being mounted on iron tired wheels. Each trailer, as well as the power car, has two electric motors, each driving a pair of wheels, therefore making each wheel in the entire train a driving member.

This train carries a load of from 30 to 32 tons, at a speed of 12 to 16 kilometers (about 7.5 to 10 miles) an hour. The load is divided evenly on the six trailers, making an even pressure on each set of wheels of about 2.5 tons. The power car carries no load except the power plant and the help necessary to operate the train.

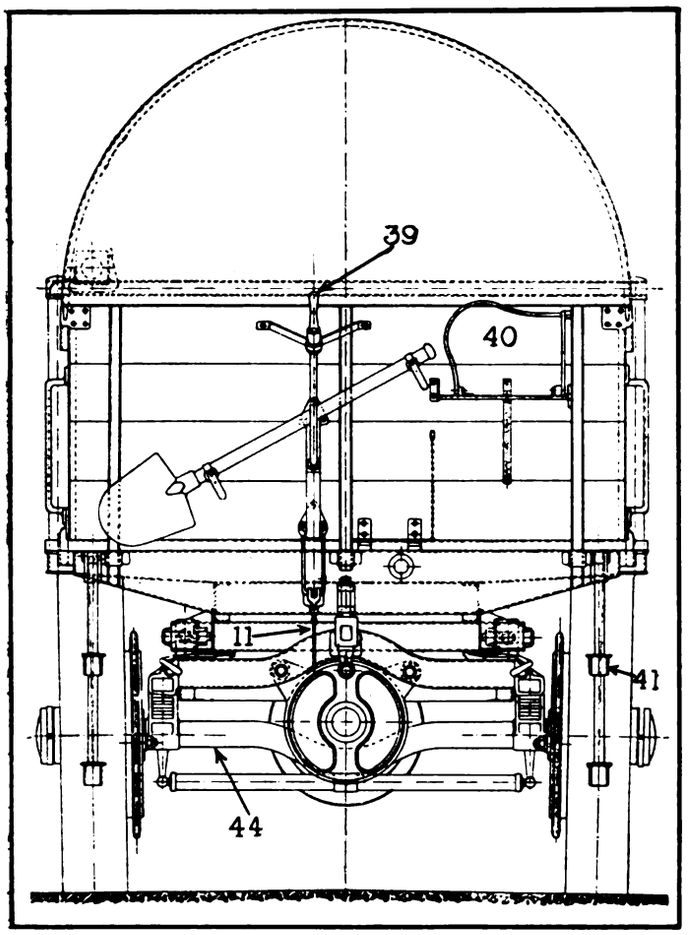
The iron tires have a width of 200 mm (about 7.8 inches), so that the loaded trucks are able to travel over soft and sandy surfaces without sinking into them to any extent sufficient to impede the progress of the train. Through extended experiment it has been found by the German government that a train of this type fully loaded can operate up a 10 per cent. grade over soft ground and pathless fields.

An accompanying page plate presents a drawing of the power car, comprising two exactly similar, complete and independent power plants, each made up of a six-cylinder gasoline motor attached to an electric dynamo, whose anchor serves instead of the customary flywheel to steady the operations of the motor. From the two ends of the dynamo shafts, which abut each other in the centre of the car, there



Top View of Muller Utility Car Chassis, Outlining Electric Driving Motors, Swivelling Trucks, Braking System, Etc.

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End View of Utility Car, Presenting Position of Brakeman's Seat, Etc.

are two Renold silent chains for the purpose of driving an exciter dynamo. The transmission of energy from the generators to the electric power motors which propel the driving wheels is by means of a direct current which is converted into electromotive force of 400 volts by the exciter dynamos.

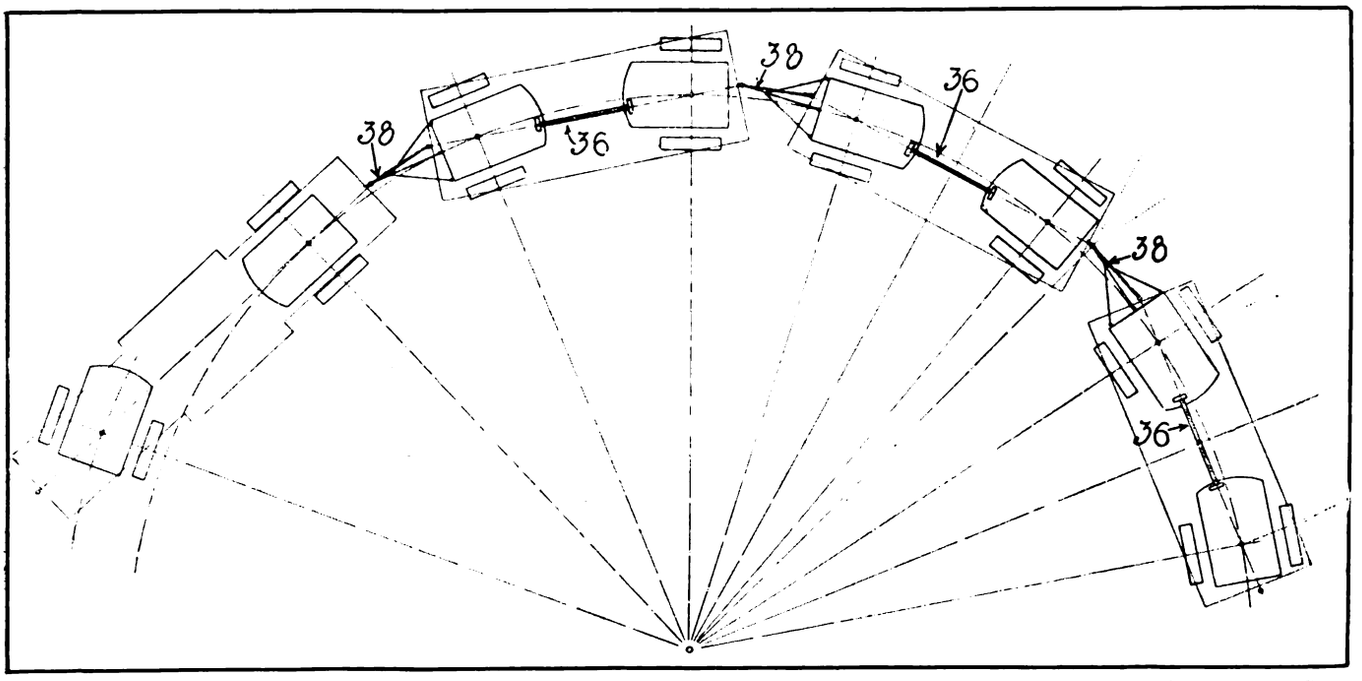
The coupling between each motor and its dynamo is by means of a shaft and two universal joints, which in order to keep the crankshaft and anchor in rigid connection without the possibility of any play, is constructed especially strong and of the best possible material. Each six-cylinder motor has a bore of 155 mm and a stroke of 170 mm (5.9 by 6.7 inches), rated at 90 horsepower at 850 revolutions a minute. The fuel is either "benzol" or heavy gasoline.

As will be noted in an accompanying sectional view, the valves are assembled in the cylinder heads and the intake and exhaust are on opposite sides. Ignition is of the Bosch make-and-break type. Cooling is by means of water circulation through a flanged cooler, this being set so low that the fan for supplying the cold air can be driven directly from an extension of the motor crankshaft. In order to prevent dust from entering the engine room, the front part of this room, under the hood, is partitioned back of the fan in such manner as to prevent the air current passing through, but notwithstanding this obstruction, the fan is fully adequate for the requirements.

That the motor may be started by hand, an opening comprising a sleeve and bushing is situated in the centre of each cooler through which the starting crank may be inserted. This sleeve and bushing are held in place by a frame extension which holds the cooler in position, and this extension is fastened to the chassis in such manner that it can be removed easily to permit necessary repairs. As in this assembly the cooler is stationed below the motor, it has been found necessary to arrange a special tank sufficiently high on the dash, within the hood, to allow the escape of any air or steam which might accumulate.

Together with the two complete power plants, the power car carries 500 liters (about 120 gallons) of fuel, and a complete supply of electric apparatus necessary for the control of the vehicle. In this equipment is included an Edison storage battery of 40 cells, employed for starting the gasoline motors, through the medium of the main dynamos, which, when thus used, are transformed for the time being into electric motors. This battery also is employed for lighting and for operating electric brakes, one at each road wheel.

All control levers on the power car, which have to do with the steering or braking of the train, are attached to or near the steering gear, and within easy reach of the

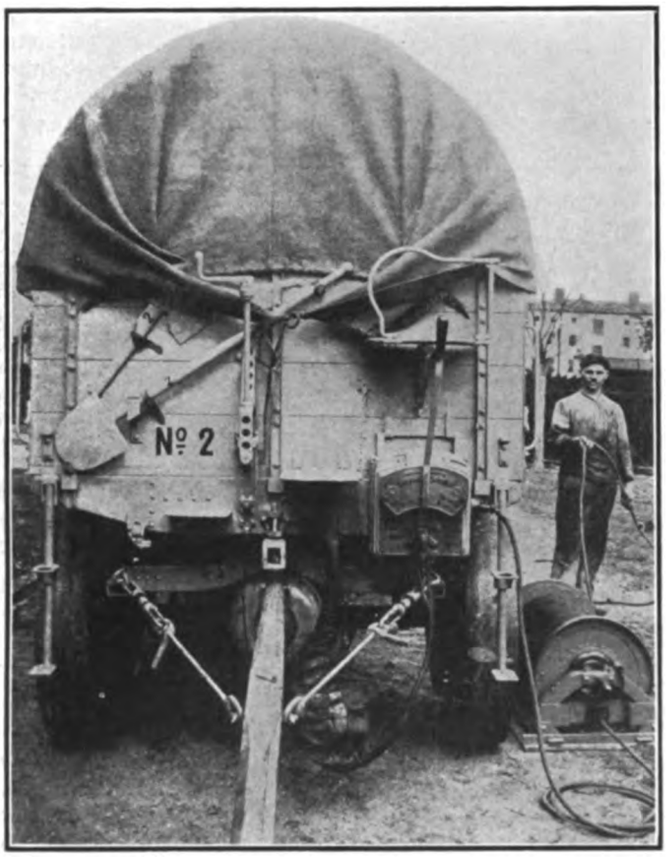


Sketch Illustrating Position of Each Member of the Entire Train While Rounding a Curve, the Power Trucks on Each Car Being Swiveled on Their Respective Turntables.

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driver's seat. All are in duplicate, as well as being assembled from interchangeable parts.

By reference to the page plate and other drawings herewith, the following figures will better explain the different parts: 1, six-cylinder gasoline motor; 2, exciter dynamo; 3, main dynamo; 4, electric motor on driving truck; 5, motor shaft; 6, brake operated by magnet; 7, pinion shaft; 8, casing for crankshaft, driving and differential gears; 9, chain for driving road wheels; 10, chain to determine extreme lateral movement of driving truck; 11, Bowden cable for operating the wheel brakes; 12, steering wheel; 13, brake wheel; 14, lever for regulating motor; 15, lever for operating magnetic brake; 16, oil tank; 17, water conduit; 18, partition; 19, water pump; 20, ventilator; 21, cooler; 22, sleeve for starting crank; 23, clutch for connecting rod between cars; 24, shaft between motor and dynamo containing two universal joints; 25, worm drive for steering gear; 26, pinion gears operating turntable; 27,

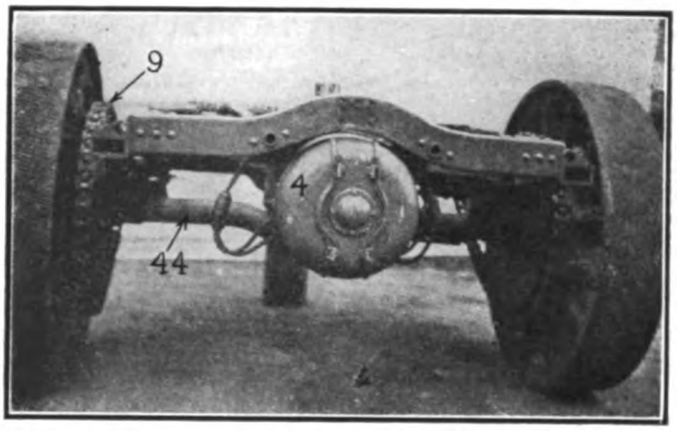


Utility Car as Seen from the Front, and Method of Controlling It When Detached from Train.

turntable quadrant gear; 28, exhaust for gasoline motor; 29, double seat with tool boxes; 30, electric battery; 32, resistance regulator; 33, fuel tank; 34, chain driving exciter dynamo; 35, electric switch for control of speed; 36, connecting shaft for steering train; 37, connecting rod between cars; 38, steering pole; 39, crank for operating hand brakes; 40, brakeman's seat; 41, step; 42, socket for pivot in turntable; 43, turntable supporting track; 44, tubular axle.

The larger drawing in the page plate illustrates the assembly of the power car with its double power plant. The front view shows the position of the cooler, water conduit, exciter dynamo, etc. The first sectional view presents the location of the worm driven steering gear, storage battery, switch and control levers. The last view is that indicating the placing of the resistance regulator, chain drive for exciter dynamo, cylinder head valves and exhaust.

The double power plant is held not only to possess the



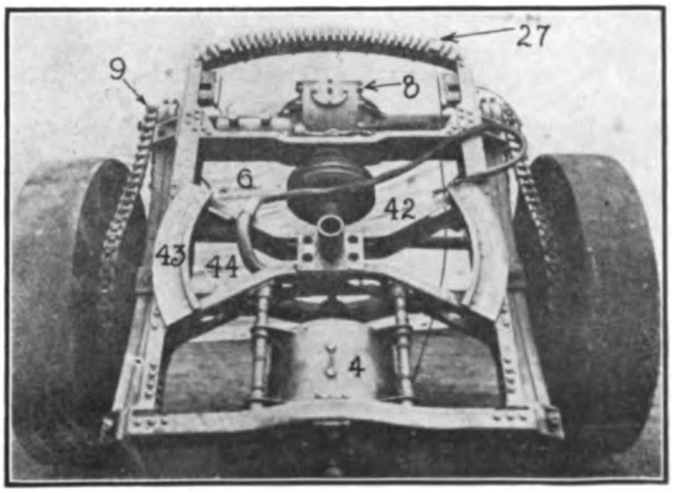
End View of Swivelling Truck, Indicating Location of Electric Driving Motor.

advantage that the train will not be placed out of service because of a defect in one of the machines, but in that it increases the efficiency of the assembly, insofar as that is possible, by operating the train on a comparatively reduced fuel consumption. When travelling over hard level roads it is claimed that it is possible to haul the train at a normal rate of speed by one motor, delivering only 60 of its 90 horsepower.

The double seat not only accommodates all the help necessary for the operation of the power plants, but the compartments underneath are so constructed as to be available for carrying tools and the reserve parts that may be required on a long journey. The double steering gears are each composed of a worm drive from the shaft of the steering wheel, which is connected with and drives a shaft and pinion gear. These pinion gears mesh with sectors fixed on the upper surfaces of the two trucks, which carry the axles and driving wheels.

In order to make the turning or steering of the trucks easy for the operator, the body of the vehicle is supported in its pivoted position by steel rollers assembled on ball bearings and resting on tracks supported by the trucks. The curved sector attached to the end of the truck frame, which is driven by the pinion gear above mentioned, is guided between rollers fixed to the frame of the chassis.

As shown, these trucks, which are practically the same in the utility cars as in the power car, are constructed of a U shaped steel frame supported on the two driving wheels by means of the springs and axle. The truck wheels are driven by means of chains, connected by cross shafts, differential and centre shaft to the electric motor. The cross



Top View of Swivelling Truck, by Means of Which Every Movement of the Train Is Controlled.

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and centre shafts are connected in the usual manner by pinion gears. The shafts and differential, as well as the motor, are enclosed in dust proof cases and suspended from the frame of the truck.

On the shaft of each motor is an electric brake, operated by a magnet and controlled from the driver's seat. As each utility car has one of these brakes, it can be seen that with a single movement of a hand lever, the operator is in a position instantly to apply the brakes throughout the entire train.

Within the chain drum of each wheel also is assembled an expanding brake, attached to a balancing member, which may be operated from the brakeman's seat situated at the end of each car. The controlling medium is that of a crank attached to the upper end of a slanted spindle, this spindle having at its lower end a screw and sleeve to which are attached Bowden cables. These cables are attached to the balancers of both trucks, making it possible for the brakeman to apply the brakes on all four wheels at the same time.

As a rule, the electric brakes are quite sufficient to control the train, and the hand brakes may be termed emergency members. It is intended that these shall be used only when the electric brakes are out of order, or in case it is found necessary to hold a single car that has been switched off in making up or detaching the train.

It has been noted that the power trucks on the utility cars and on the power car are practically the same, the only difference being that in the former the body of the vehicle is supported on the centre pivot and on shoes sliding on the curved tracks which form a turntable, while in the latter steel rollers are substituted for the sliding track. An accompanying drawing shows the entire train as it would appear while rounding a curve, and it will be seen that the power trucks of each car are swivelled on their respective turntables. Each truck is turned to a corresponding angle with the radius and the curve to be followed. This is accomplished by means of the steering shafts, which are geared so as to turn the sectors of each truck at the same proportionate angle, but in an opposite direction to the one preceding it. These steering shafts are assembled slidably in their sockets or bushings in order that they may be relieved of all shocks or thrusts. Strong shafts with double universal joints attached to spring bearings connect the cars as can be seen in the illustrations. For making up trains or moving the single cars around independently of each other, a very novel plan has been adopted. As shown in an accompanying photograph, this consists merely of connecting a power cable to the car, by means of which it is supplied with power from a stationary storage battery. The car then may be started and stopped, within the radius permitted by the cable, from the brakeman's seat, a lever being provided for that purpose as shown. Steering is accomplished by means of a wagon pole, easily attached, and this pole also can be used to good advantage in steering around very sharp corners

LARGE ORDER FOR PEERLESS TRUCKS.

Throughout the country the leading express companies are replacing their horse drawn equipment with the more progressive form of transportation, and it is interesting to note that the exhaustive tests conducted by the engineers of these concerns have resulted in a favorable report and the adoption of the mechanical transport.

Different size cars were placed in service and operated under conditions more exacting than the horse drawn equipment. During this work they were watched carefully by the engineers and traffic experts who made accurate estimates of the performances of the vehicles as compared with other methods of hauling.

The American Express Company, one of the leading organizations of its kind, experimented with the automobile and some time ago placed five Peerless trucks, made by the Peerless Motor Car Company, Cleveland, O., in service. These were given severe usage and the result was that the company placed an order for 11 more machines. In the accompanying illustration is shown eight of the new vehicles which have been tested out and are ready for the fitting of special bodies.



Part of a Fleet of Peerless Trucks Purchased by the American Express Company Which Adopted These Vehicles After Exhaustive Tests.

PUEBLO BUYS NEW PRISON VAN.

Pueblo, Col., which experimented with the automobile police patrol, utilizing a second hand pleasure vehicle, has replaced the machine with a Cadillac to which has been fitted a special body so constructed that it will accommodate a large number of prisoners as well as officers.

MILTON, MASS., HAS NEW PATROL.

Chief Maurice Pierce of the Milton, Mass., police department has purchased a new automobile police patrol to replace the old vehicle which has been in service for over two years. The new machine provides seating capacity for five persons.

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New Commercial Car Accessories

Young's Self-Starter.

A device whereby gas lamps may be lighted and extinguished from the seat by the throwing of a switch, is manufactured by A. G. Young, Pittsburg, Penn. The selling agent is William H. Pollock, 607 Webster avenue, of the same city. The equipment consists of a dash valve which controls the flow of acetylene, switch and wire, and burners. The last named are fitted with a practical sparking arrangement, so constructed as to withstand hard usage as well as heat. When the switch is operated the regular current is utilized to jump a spark across the gap at the burners, igniting the gas. It is claimed that the device will save 50 per cent. on gas bills, may be attached in a few minutes by anyone, and does not require any attention whatsoever.

Fitzall Wrench.

Providing instantaneous adjustment and a positive grip are the features emphasized of the Fitzall wrenches, manufactured by the Standard Wrench & Tool Company, Providence, R. I. The tool is free from adjusting nuts, being constructed in three parts, these operating on the inclined plane or wedge principle. In practise the movable jaw member may slide forward or backward and when pressure is applied, the tooth block locks the parts securely. They are made in different sizes and in the regular form, as well as for working on pipes. It is claimed that the only part subject to wear is the tooth block and as this is removable it may be replaced easily, and the member is not expensive.

Vixen File.

The superior abrasive qualities of the Vixen file, the product of the Vixen File Company, Philadelphia, are said to be due to the peculiar construction of the teeth. These are semi-circular and are cut especially deep. The tool is adapted to soft and tool steel, cast and wrought iron, bronze, brass, etc., and it is claimed that owing to its self-clearing properties will cut soft metals without clogging, will not slip or chase, and operate equally well on greased surfaces. It is claimed that the Vixen product may be resharpened from four to six times, this depending upon the number of teeth to an inch. The files are made in different sizes and styles.

Hagstrom Spark Plug.

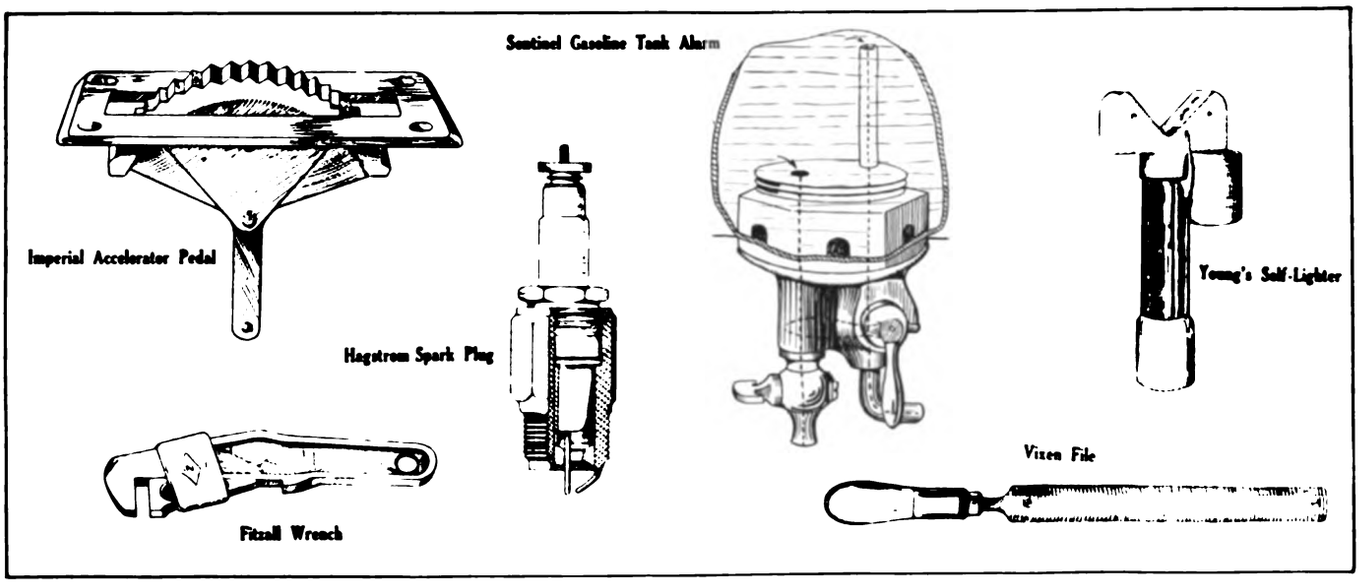
The Hagstrom Bros. Manufacturing Company, Lindsborg, Kan., has brought out a new type of spark plug, the feature of which is the fitting of a porcelain guard in the shell proper, and surrounding the exposed end of the electrode. It is claimed of this arrangement that oil is prevented from working up into the plug, that the main porcelain is protected against undue heat, and that short circuits by carbon are eliminated.

Wixon Accelerator Pedal.

An accelerator which is operated with the foot in a flat and natural, as well as relaxed position, is being marketed by the Imperial Brass Manufacturing Company, Chicago. The device is know as the Wixon and consists of a flat plate for attaching to the floor board carrying a pivotally mounted half-wheel which is provided with teeth designed to prevent the foot from slipping when operating over rough roads. Attached to the wheel is a lever to which is connected the rod leading to the carburetor. It is substantially constructed and may be attached to any car in a few minutes.

Sentinel Fuel Tank Alarm.

The Sentinel gasoline tank alarm, made by Zwillinger & Feldman, New York City, consists of a standpipe which extends upward from the bottom of the fuel container through which the fluid flows until it falls to the level of the pipe, thus signalling the operator that the regular supply is exhausted. To utilize the reserve, a valve is turned and the device may be locked with a key to prevent tampering with the fuel supply. It is attached easily to any tank, the operation involving the cutting of a circular hole about 1.5 inches in diameter in the bottom of the container, the removal of the nut from the latter to allow the washer to rest between the bottom of the tank and the flange of the alarm, and the screwing down of a nut on the inside of the tank. The device is also equipped with a filter.



Some Recent Accessories, Including an Acetylene Lighting Device, Accelerator Pedal, Fuel Tank Alarm and Quickly Adjusted Wrench.

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The MOTOR TRUCK
Devoted to Motor Driven Business Vehicles of All Classes.

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Anonymous communications not considered. Correspondence on subjects relating to trucks, delivery wagons, taxicabs, tractors, all motor driven farm, fire, and municipal apparatus, the motor industry and the trade, will receive attention. Stamps must be enclosed to insure return of unsolicited contributions.
Entered as second class matter, February 25, 1911, at the Postoffice at Pawtucket, R. I., under the Act of March 3rd, 1879.

TRANSPORTATION EFFICIENCY.

That the mechanical transport is capable of being operated in a manner to bring about decided economy over horse drawn equipment is now generally conceded. So many concrete instances have been presented that there can be no mistaking this point. However, there is one important phase of the situation that is being recognized more largely by both the business man and the vehicle manufacturer. In order to secure the utmost economy with the motor truck, it must be worked as nearly to its maximum efficiency as is practical.

With some lines of business this side of the problem is more easily solved than with others. Each delivery system has its own particular features, and while it may be necessary to rearrange existing methods to accommodate the newer type of haulage in the retail grocery or department store service, for instance, this is a condition which can be handled largely by the delivery superintendent with comparatively slight assistance from other sources.

Special attention is now being paid to those lines which in the natural order of things may be expected to utilize vehicles of large carrying capacity, reference being had more particularly to the coal, lumber and kindred industries. With these the body equipment is decidedly essential, but the complete solution does not end with the chassis and body.

Efficiency in motor transportation means that the vehicle shall be kept moving with a useful load. Obviously, with some industries it is an impossibility to carry a useful load in both directions, and with such the maximum efficiency of the truck is measured by the length of time during which it can be thus employed. Delays at either end of the line must be eliminated first of all, and this presents a situation in which others than those directly connected with the manufacture of automobiles or bodies are called upon to exercise their ingenuity.

WEATHER EXTREMES AND HORSES.

According to the records of the board of health in New York City, more than 20,000 horses died in the streets of that city during 1911. Seventeen hundred were removed by contractors during the fortnight ending July 8. In one week in December 500 were lost in a similar manner. It would appear that extreme cold with its attendant snow and ice, was nearly as fatal to horses as extreme heat.

These figures should prove of interest to the man who is contemplating the installation of commercial motor vehicles, inasmuch as the extremes of temperature in either direction are by no means fatal to the mechanical transport. It ought also to be remembered that the loss occasioned through death by no means represents the sum total of the business loss occasioned by dependence upon animal transportation as the result of the weather, since the motor truck is able to work at its maximum capacity when it is unsafe to attempt to utilize horses.

MOTOR TRUCKS AND ROADS.

As was perhaps to be expected, one result of the bill introduced into the Massachusetts Legislature seeking to limit the weight of industrial transports using the public highways has been to call direct attention to the economic value of the vehicles. And it is of special significance that the motor truck has demonstrated its ability along this line so satisfactorily that in every case there has been no disposition to dispute its superiority.

In the first place, it must be admitted that roads, good or bad, exist for the benefit of the public. Little thought has been given to this matter in the past. Governmental reports show that much of the so-called high cost of living is directly traceable to the difficulty experienced in getting farm products, for instance, to the market, and by no means all of the transportation cost is charged to the railroads.

If this problem is to be solved by a more general use of motor trucks, it would appear to be good economics to consider the construction of roads which will stand up under modern usage. No one seriously questions the fact that the transportation of the future is to be by mechanical means. It is poor public policy to discriminate against a type of transport of such large importance as the motor vehicle.

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THE A B C OF MOTOR TRUCK OPERATION.

A Simple Exposition of the Principles Underlying Operation, Maintenance and Repair of All Motor Driven Commercial Cars, Describing Details of Their Components. Part XVII—The Progressive Transmission and Other Types.

By C. P. Shattuck.

OTHER forms of sliding gearsets are utilized in motor truck construction besides that of the selective type previously described but they all serve the same purpose, that of providing a variable rotation of the driving wheels without necessarily changing the speed of the motor to bring about the desired results. The components of the gearbox or transmission in the mechanical transport are subject to stresses not encountered by the mechanism of the pleasure vehicle, and in designing and constructing these members the engineer has made them sturdy, of high grade material and as simple as possible. To prevent damage by careless operation devices are incorporated so that changing from a forward speed to a reverse with machine moving cannot be accomplished except by design.

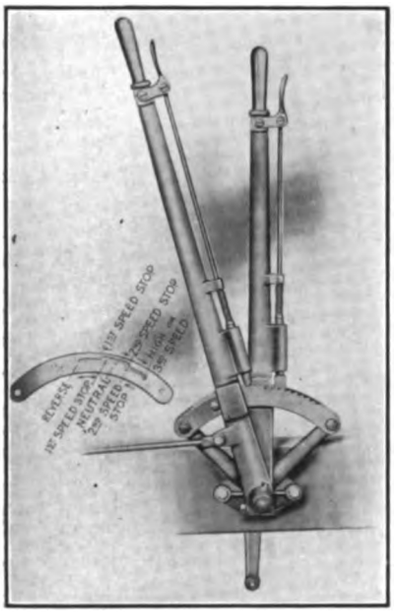


Fig. 69—Depicting Quadrant and Lever Utilized with Progressive Type of Transmission.

In the selective type the changes of speed are effected by a lever at the side of the driver and this may be at the right, left or centre, according to the design of control. The quadrant, or metal frame is so slotted that the lever may be pushed backward or forward in any one of the three parallel channels. For example, if the lever be moved forward in one channel it engages or brings into mesh a set of gears which produces the low speed. Bringing the lever directly back releases the gears already in mesh and slides a different set into engagement; for instance, the second speed. To shift into the third, the lever is moved sidewise and thrust forward into the direct or third speed. The fourth is obtained by a backward movement, and the reverse by moving the lever into the third channel, but before this is done a catch or stop member must be released. This device is fitted to prevent the operator shifting from a forward speed into the reverse when the use of the latter is not desired.

The selective quadrant is not always H shaped, some being similar to a slot, but the movements in changing speeds are the same. It is customary to mark the positions or speeds upon the quadrant and it will be noted that the location of these varies; that is, the same relative movements of the lever will not bring about the same changes of gears on all machines.

One of the earliest practical forms of sliding gear mechanism was the progressive, which derives its name from the fact that in advancing from the low to the high, or in reducing from the latter to the low, one must go through the different speeds. If in the reverse, the low and intermediate must be gone through to reach the high or direct.

A conventional type of progressive gearset is depicted at Fig 70, and it will be noted that the design makes for simplicity inasmuch as the shifting mechanism consists of a single yoke operating in conjunction with a shifting rod. The gears are enclosed as are those of the selective type, in a box or housing which is constructed so that the upper half may be removed, and these cases are provided with inspection or handholes for the purpose of replenishing the supply of lubricant.

Two shafts are mounted so that they revolve freely, the mainshaft being a compound while the other or layshaft is a simple member. The mainshaft is square in form, is connected with the clutch member and rotates when the clutch is engaged. Gears A and B, Fig. 70, move freely upon this shaft when actuated by the yoke, but unless one of these gears is in mesh with another on the layshaft, or the member A is moved so that the high or direct drive is brought into use, the shaft will remain stationary when the clutch is disengaged.

The layshaft, which is a round member, carries four pinions and it will be noted that these are of different size. The smallest of these is constantly in mesh with the largest gear in front of the pinion member and these are known as the constant mesh gears, their function being the same as those described in the selective type of gearset. All pinions on the layshaft are fixed members; that is, they cannot rotate without correspondingly moving the shaft. When gears

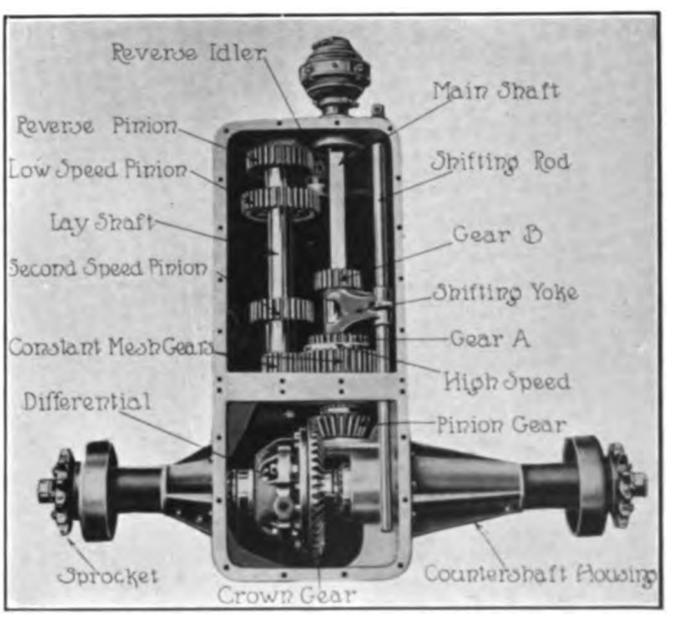


Fig. 70—Outlining the Components of Progressive Form of Gearbox.

A and B are so located on the mainshaft that they are not in mesh with any other pinion or the high speed is not engaged, a neutral position is brought about, and when in

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this position the clutch may be let in without imparting movement to the countershaft and thence to the driving wheels through the pinion and crown gears.

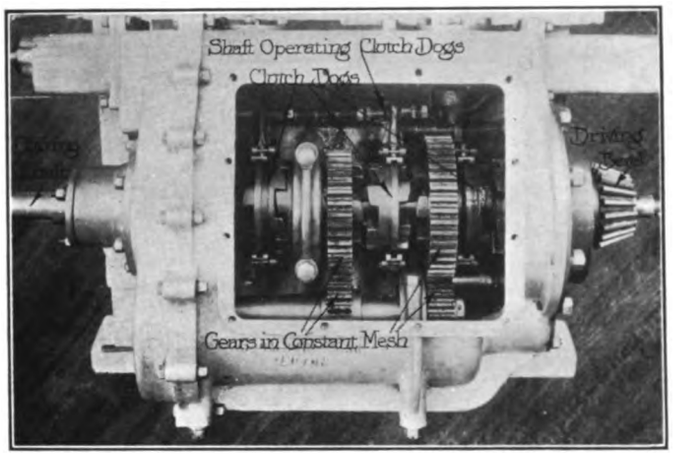


Fig. 71—Transmission of the Constant Mesh Gear Type in Which Changes of Speed Are Effected by Clutch Dogs.

Assume that the car is standing still, the clutch is disengaged, and the lever in the quadrant is in neutral position. To bring about an engagement of the low speed, the lever is moved forward until the first speed notch is reached, which movement slides the yoke and gear B along the mainshaft until the gear meshes with the low speed pinion on the layshaft. The clutch is then let in, and the mainshaft revolves, turning with it the gear B which in turn imparts motion through the low speed pinion and the layshaft revolves as does its constant mesh gear. The latter being permanently engaged with the other constant mesh member rotates this, which is connected to the pinion gear, imparting motion through the crown gear and countershaft to the road wheels.

To change to the second or intermediate speed, the clutch is released, and the lever moved backward into the second speed stop. This movement slides the gear A into mesh with the second speed pinion and motion is imparted to the road wheels by the same process as with the low speed. In changing to the direct or high speed, the lever is moved into the third speed notch which movement slides gear A and the positive jaw clutch into engagement. The mainshaft is then rotating at engine speed and the reduction between the speed of the motor and road wheels is obtained by the gear ratios of the pinion and crown members.

To bring about a reverse movement of the machine, the gear shifting lever is moved to the reverse notch, which brings gear B into mesh with the intermediate reverse idler, and when the clutch is let in the idler member will rotate in a direction opposite to that of the mainshaft. The idler being in mesh with the reverse pinion the latter will revolve the layshaft on which the constant mesh gear will rotate the other constant mesh member in an opposite direction, bringing about a backward movement of the vehicle. In changing from the reverse to the first speed, and thence to the high, the different gears must be meshed, as previously explained.

At Fig. 69 is shown the gear shifting lever, also the brake member and the quadrant with the notches clearly outlined. It will be noted that the gear changing member is fitted with a toothed member, actuated by a spring, the object of which is to hold the lever in the position set. A rod connects the notch member and is pivotally mounted to a handle for the purpose of releasing the tooth when a change of speeds is desired.

Other forms of transmissions are utilized in addition to those of the selective and progressive types outlined. At Fig. 71 is presented a gearbox of the constant mesh type for which many advantages are claimed, among these being an even distribution of the load around the shaft and the eliminating of danger from stripping teeth through careless operation. With this type there are two sets of gears in constant mesh and the mainshaft is provided with clutch dogs of sturdy construction and high grade material. These dog members are shifted into and out of engagement and when one is locked or meshed with a gear imparts motion to the pinion with which it is constantly meshed. Changes are effected by a lever and this type of transmission is made in the selective form; that is, the operator may change from one speed to another without going through the intermediate speeds.

A selective clutch patented transmission is depicted at Fig. 72 and with this type the gears are constantly in mesh. Any desired speed may be obtained by the operator by movements of the controlling lever actuating a clutch, which in turn slides a gear into engagement with a similar member.

The mainshaft is a squared member and carries a number of movable gears or clutches. It will be noted that gears B, C, D and E, are in mesh with other members directly opposite, and that between the gears on the mainshaft are a number of smaller members. The male clutches at W operate on the squared portion of the mainshaft in either direction, and mesh in the female clutches at O O O O which movement in turn drives the constant mesh gears. As a large number of teeth engage at the same time it is obvious that the load is distributed and stresses reduced to a minimum. On the high speed, the male clutch A releases from the female inside B, leaving gears C, D and E idle, and drives directly through the mainshaft to the differential.

As gears and clutches are subject to heavy stresses they are constructed of a high grade steel and cut accurately by special machinery. The edges of the gears in the sliding type are chamfered to facilitate their meshing. Roller and ball bearings are utilized; that is, the shafts revolve on these members, which operate in a bath of heavy oil or lubricant. The gearboxes are constructed dust proof and the halves machined carefully so that an accurate fit is ob-

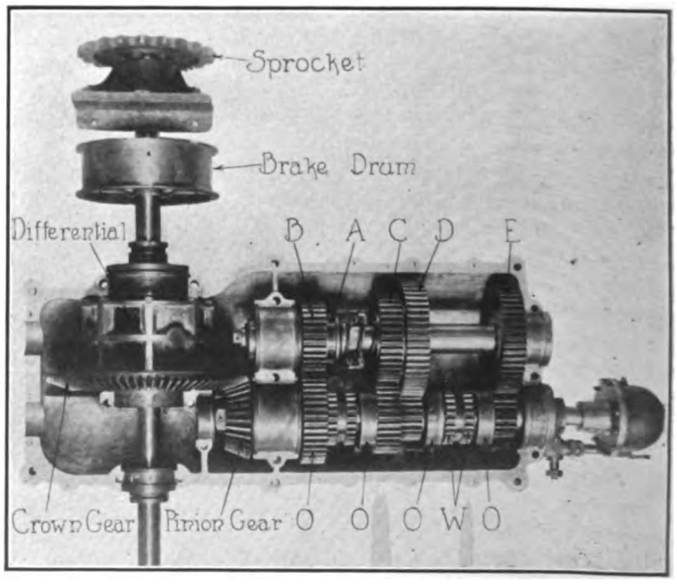


Fig. 72—Another Form of the Constant Mesh Gear Transmission of the Selective Type.

tained, thus preventing the escape of the lubricant.

In some designs the gearbox and differential housing are constructed as a unit, as shown at Figs. 70 and 72. In

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the former the housing is separated by a partition, an arrangement which provides for the use of a different grade of lubricant in the gearbox and for the differential gears.

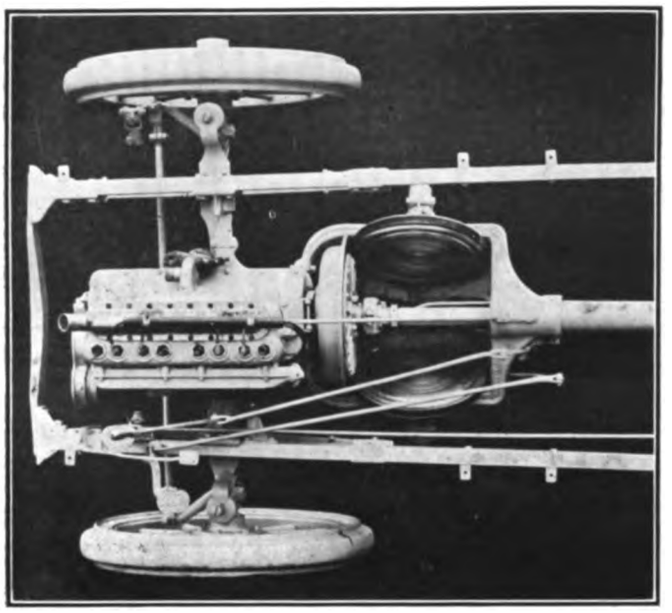


Fig. 73—Friction Transmission Utilising Discs for Low and Reverse—The Clutch Is Shown in High Speed.

Where the final drive is by chain, the transmission and differential are employed as a unit as indicated.

Where shaft drive is employed, or an internal gear drive on the rear wheels, the gearbox is usually located amidships, although it may be placed on the rear axle and made a part thereof. Gears are not wholly employed in the constant mesh type of transmission as chains may be used. This form is growing in popularity abroad where the silent chain drive is being utilized on many leading mechanical transports.

Mention has been made of the friction transmission in which energy is imparted to the driving wheels by a disc in contact with a similar member integral with the flywheel of the motor. At Figs. 73 and 74 are presented a form of friction transmission that is unique, inasmuch as it is employed only in bringing about the low speed and reverse ratios. The direct or high speed is secured by a cone clutch which differs only from those of the usual form in that it may be moved from contact with the female member or flywheel to a considerable distance. This is necessary in order to permit of the operation of the friction discs; that is, to bring about the low speed and a reverse movement which are obtained by moving the cone member forward or back as necessary.

The friction member is clearly depicted at Fig. 74 and in engagement with the other discs. The former is slideably connected with the propeller shaft and is moved forward or backward, being operated by a lever convenient to the driver. In practise the clutch is held out in starting and a feature of the transmission is that the driving discs are stationary when not in operation. That is, they do not revolve when the high speed is being utilized, as the cone clutch engages with a similar member in the flywheel moving the latter away and out of engagement with the pair of discs. When the clutch is released for a neutral effect, by a pedal, the flywheel member does not come in contact with the discs until the operator moves the controlling lever. When the latter is operated and the clutch let in, energy is transmitted through the driving discs to the driven disc.

An innumerable number of ratios is obtained. When the driven disc is near the centre a very low speed or reverse is obtained. This ratio is increased by moving the driven disc toward the periphery of the driving members. At Fig. 74 is shown the discs in engagement for the reverse and as the centre disc is near the centre of the driving members a low ratio will be obtained.

If the driven disc be carried forward of this centre position, a forward speed will be produced, the ratio being determined by the position of the driven member; that is, the nearer to the flywheel, the greater the speed. This forward and reverse movement is brought about by the driving discs, which rotate in opposite directions.

(To Be Continued.)

Ed. Note—The next installment will deal with the differential and the different methods of transmitting power to the driving wheels.

FALL RIVER TO BUY AMBULANCE.

Fall River, Mass., has decided to follow the example of other progressive cities in adopting the automobile for municipal service. It was voted recently to purchase an ambulance, and $4000 was appropriated for this purpose.

JARVIS-HUNTINGTON'S GUARANTEE.

The subject of the written guarantee supplied by manufacturers of commercial vehicles when making a sale is one which interests prospective purchasers, and to which many makers have given extended consideration. The Jarvis-Huntington Automobile Company, Huntington, W. Va., maker of the Jarvis-Huntington line, has given the matter very careful study, and has formulated a guarantee which it believes will make a decided appeal to those who are interested in the purchase of automobile equipment. It reads as follows:

"We guarantee our trucks against defective material and workmanship for 10,000 miles, to the extent that we will furnish, free of charge, new parts in exchange for defective parts, provided said defective parts are returned to us, charges prepaid. This guarantee does not apply to tires,

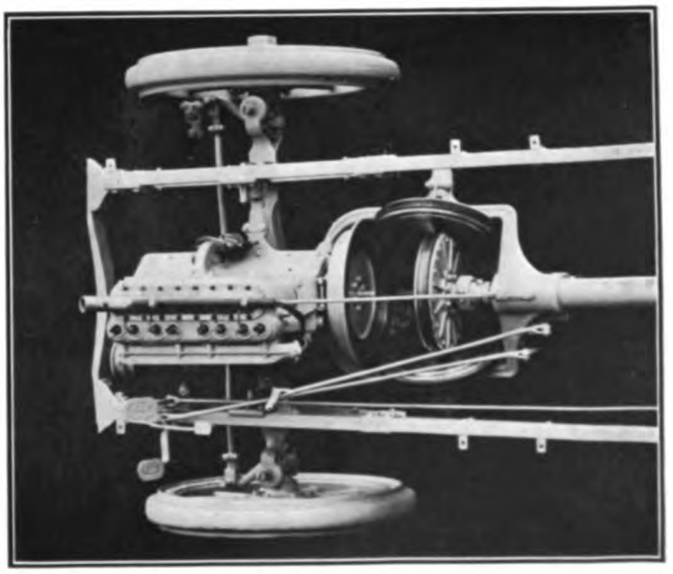


Fig. 74—Friction Transmission, Depicting the Driven Disc in Position to Obtain a Backward Movement of Vehicle.

electrical equipment, wear and tear, accidents or misuses of truck.

"JARVIS-HUNTINGTON AUTOMOBILE COMPANY."

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KISSELKAR TRUCK IN NOVEL USE.

Commercial vehicles are put to many uses among which may be mentioned that of hauling supplies and transporting the products of the farm to the railroad, etc. In breaking the ground, however, a tractor usually is employed, but Orlando Moore of Visalia, Cal., has adapted his three-ton KisselKar truck, made by the Kissel Motor Car Company, Hartford, Wis., to this work. He fitted the rear wheels of the machine with flanges, as will be noted in the accompanying illustration, and with these devices obtained traction enough to haul a 24-double-disc cultivator in front of a 12-disc seeder. The machine is utilized for plowing, seeding, cultivating, etc., and in addition hauls supplies and performs all work formerly done with horses.

The vehicle is equipped with a four-cylinder, four-cycle, water-cooled motor having a 4.875-inch bore and five-inch stroke, rated at 50 horsepower. Ignition is by a high-tension magneto and lubrication is by splash. A leather faced cone clutch is utilized and the transmission is of the selective type providing four speeds forward and reverse. Final drive is by chain and a differential lock is fitted. Solid tires are employed, the front members being 36 by four inches, single, and the rear are dual of the same size. Two sets of brakes are provided, internal on rear wheels, and external on jackshaft. The wheelbase is 144 inches and the space back of the driver's seat is 12 feet 3.5 inches.



KisselKar Three-Ton Truck Utilized by Orlando Moore of Visalia, Cal., for Plowing, Seeding, Cultivating, Etc.—The Rear Wheels of the Machine Are Equipped with Flanges to Provide Traction.

WAR DEPARTMENT BUYS MAIS TRUCKS.

The United States War Department has placed an order for four Mais trucks, made by the Mais Motor Truck Company, Indianapolis, Ind., and has sent a squad from the ambulance corps to the factory. The soldiers will be instructed in the care and maintenance of these internal gear driven machines which will be utilized for field duty service at Washington.

The trucks are practically completed and have been constructed sturdily and in keeping with the requirements of the government, being equipped accordingly. Large wheels are fitted, these being with five-inch dual tires. The bodies are provided with adjustable seats so that they may be used for carryalls about the forts or for ambulance duty. The litters are suspended from the roof of the car by straps.

G. M. C. EDUCATIONAL CAMPAIGN.

Gleeson Murphy, vice president of the General Motors Truck Company, Detroit, left that city recently for a trip to Boston, New York and Philadelphia, where he will hold conferences with the selling representatives of the company. The Detroit concern is promoting an educational campaign and is planning to give every manager and sales agent a complete knowledge of the responsibility, permanency and manufacturing scope of the company, and to this end Mr. Murphy will give a series of talks at each point visited. He will also touch upon local conditions and discuss other features of interest to the branches.

He will be followed by expert engineers in both the gasoline and electric field, who will discuss the G. M. C. trucks and give such technical information as will enable the salesmen not only to become more proficient in talking about the various models, but a better understanding of transportation problems as they affect individual companies. The service system of the company will also be discussed. This is an important branch, analyzing as it does, the needs of any business and making such transportation recommendations, either gasoline or electric, as are best adapted.

The engineering corps will be followed by representatives of the sales department and other business authorities who will discuss branch management and salesmanship. This series of talks is intended not only to bring the various branches together in better understanding, but enable the agents to discuss transportation problems with prospective purchasers.

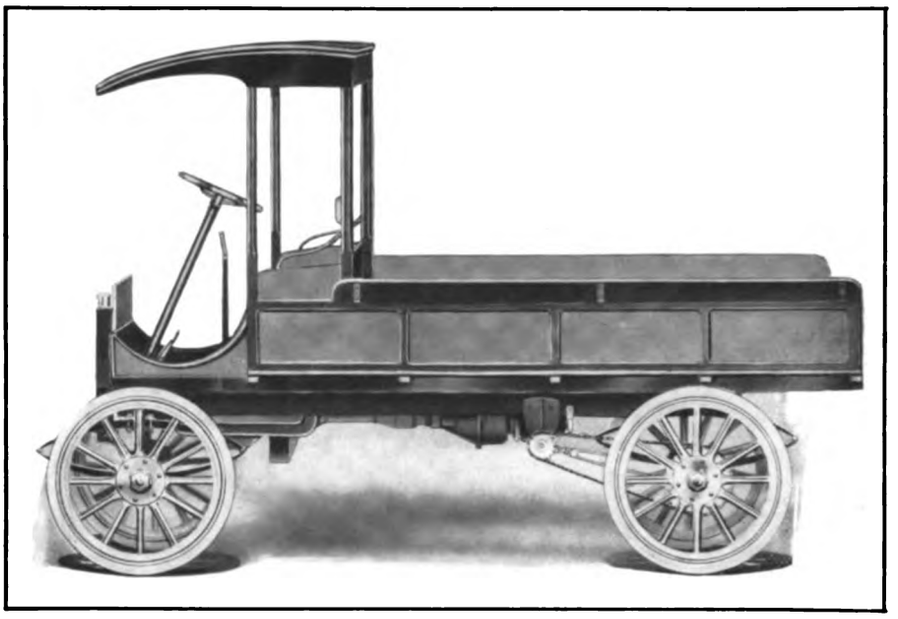
ADD TO 'BUS LINE.

The North Shore Transportation Company, which operates motor vehicles between Lynn and Swampscott, Mass., is having another machine constructed to go into commission in the spring. The company, which was incorporated last January, comprises Patrice Theriault, Eben B. Phillips and James J. Liffin. The concern intends to experiment with pneumatic tires on the front wheels of the new vehicle and cushion members on the rear. The 'bus now in service averages about 1000 miles a week, it is said, between the towns mentioned.

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AVAILABLE WAGONS FOR LIGHT DELIVERY.

LIGHT delivery wagons, ranging from 1000 to 2000 pounds capacity are meeting with decided favor in all sections of the country. Their size is such as to make them particularly adaptable to many lines of business. It would appear that the manufacturers realized this, in view of the large number of such machines which has been placed upon the market within the past few months.



Available Light Delivery Wagon Fitted with Flare Board Body.

Among the latest productions of this character is the Available, made by the Available Truck Company, Chicago. This is manufactured in two sizes, of 1500 and 2000 pounds, respectively, and with a wide variety of body designs. Accompanying photographs present the two chassis, one fitted with flare board body and the other with open grill.

The maker has paid particular attention to the power plant, which may be conceded to be one of the important features of any motor vehicle. In both wagons, the motor has been designed for the work which it is called upon to accomplish, and no pains have been spared in carrying out this idea.

In the smaller car, the motor has a bore of five inches and a stroke of four, being of the water-cooled, two-cylinder, four-cycle type. The connecting rod bearings are of brass, babbitt lined, while the other bearings are of Parsons' white brass. The material is such as is calculated to make for long life and efficiency.

The oiling system comprises a reservoir of 2.5 gallons capacity, located in the crankcase. The lubricant is circulated by means of a centrifugal pump driven by the camshaft. The entire system has been tried out under exhaustive tests and is held to be thoroughly efficient.

In keeping with the demand for some method of regulating the speed of the truck in the hands of the operator, a centrifugal governor is fitted, this being directly connected with the butterfly valve in the intake manifold just above the carburetor. When this is set to any certain speed, it is impossible for the driver to exceed this limit, without knowledge of the owner.

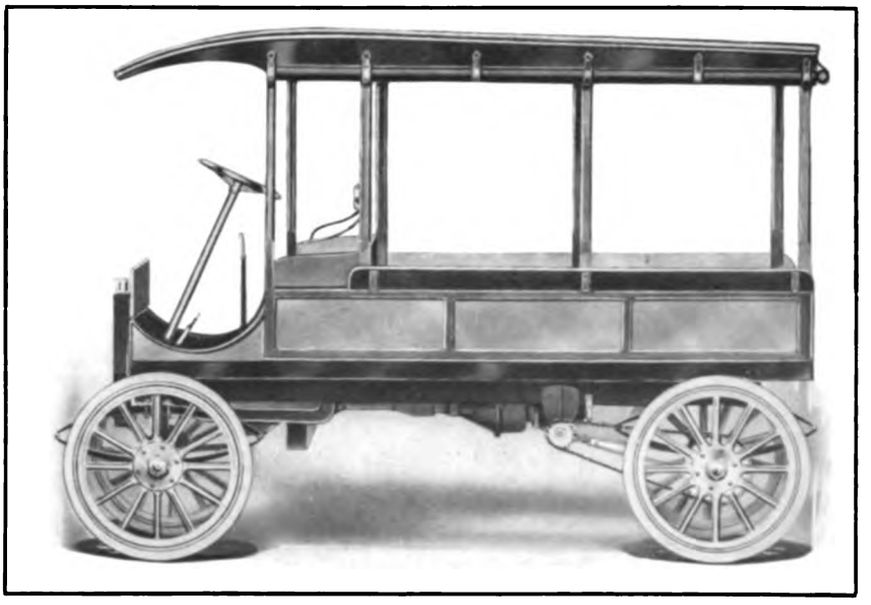
The radiator is of the square tube type, extra large, and is guaranteed to keep the motor cool at all times. The drive is by shaft to the jackshaft, thence by two Diamond roller chains to the rear wheels. The transmission is planetary, and is a unit with the jackshaft. Both sets of brakes are located in the rear wheels, the emergency members being of the expanding type and the service, contracting.

Wheels are 34 inches in diameter, fitted with solid rubber tires. An option in tire size is permitted, being either two or three inches in cross section, depending upon the load to be carried and the desires of the purchaser.

The one-ton model is very similar in design, but is made heavier in almost every respect. The motor has a bore of 3.25 inches and stroke of four, employing the same circulating oiling system and centrifugal governor. The brakes consist of 10-inch service members on the jackshaft and 12-inch emergency brakes on the rear wheels. A similar tire choice is permitted, the cross section being from 2.5 inches to four. The wheelbase of this model is 108 inches. The maker has found that the larger wagon makes a decided appeal to furniture concerns, and has arranged to provide a standard body for this work. This has a loading space of 44 by 108 by 24 inches, with a 22-inch tail gate, which extends the available loading space to 10 feet 10 inches.

WILL REPRESENT ROWE PRODUCT.

The Rowe Motor Truck Company, Coatesville, Penn., which made initial display of its Rowe trucks at the recent Grand Central Palace show in New York City, announces the appointment of George I. Pound as general eastern sales manager, with temporary headquarters at 327 East 84th street, New York City. The company anticipates a successful season's business, particularly in the East.



Larger Type of Available Vehicle with Open Grill Express Body.

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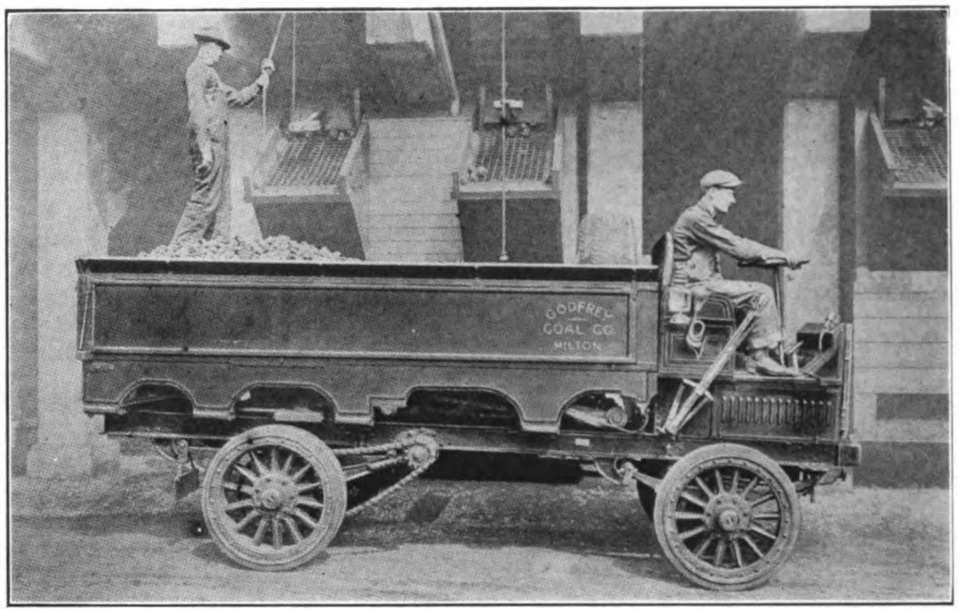
ECONOMIC METHODS OF COAL TRANSPORTATION.*

Relation of Proper Loading and Unloading Facilities to the Maximum Efficiency of Mechanical Transports.---Suggestions for Reducing General Operating Costs.

By William Kennedy, Consulting Engineer.

IN ATTEMPTING to supersede horse equipment in the transportation of coal with motor trucks the vital question is whether the conditions of operation can be so modified as to permit of applying the machine to such an amount of its capacity as will reduce the present cost with horses. In other words, there is no question that, if conditions are arranged so that the machine can be permitted to operate for a sufficient period of the working day, it will readily effect a saving.

There are at present many impediments to such machine employment, due largely to delays incident to making the delivery as well as the delays quite frequently experienced in loading at the coal yard. Unloading conditions present the greatest difficulties because they are usually beyond the control of the operators, but the yard conditions being absolutely in the hands of the coal operators, there should be no reason why the loading of coal cannot be accomplished with very short delay to the machine.



Mr. Kennedy Considers Loading by Means of Overhead Hoppers to Be the Ideal Method.

Another important consideration is that unless the loading and unloading of the coal is performed by mechanical means it is difficult to show a saving, unless the distance over which the coal is transported is sufficient to make the speed of the truck effective as a saving. The dependence upon any hand method of loading and unloading is prohibitive.

Another impediment is the fact that the transportation of coal is a seasonable performance and the long months of inactivity, as well as the difference in volume of business between the mid-winter conditions and the periods of lesser activity at the beginning and end of the season, make it somewhat difficult to decide upon an equipment which will be large enough to take care of the maximum conditions and yet will not involve too much investment for the average or normal conditions, and further, the possibility of selecting an equipment of such character as to permit of its use in other lines of service when not required for coal transportation.

Relative to Loading Means.

That the difficulties referred to with regard to loading operations can be changed to provide for quick loading by mechanical means is quite apparent from the number of coal yards which are equipped with hoppers and other mechanical devices which provide for quick loading of the coal, but where such equipments are not in existence the coal dealer has not only the consideration of purchasing an expensive equipment of automobiles, but frequently in addition an expensive modification of his yard facilities.

It goes without saying that the ideal way to load motor trucks would be automatically from the hopper system, the machine passing under the hopper and taking its load in a very few minutes and immediately starting upon the delivery. If this hopper equipment be not in existence the most inexpensive solution of the matter of lessening the delay in loading would be to employ extra bodies, which might be loaded in the absence of the machine and which could be quickly mounted or demounted by the power equipment of the machine itself. This plan might avoid the necessity of any serious change in yard equipment and the cost of loading by hand would not be a serious consideration when contrasted with the investment necessary for mechanical loading. Several plans already have been employed by which separate or spare bodies are utilized in this manner, the body in some cases being hoisted vertically off the truck and held in a suspended position while being loaded until replaced on the machine again for delivery.

Provisions for Unloading.

In making deliveries of coal such a variety of conditions are encountered as to make it often difficult to determine whether the automobile body should be stationary with end or side inclined chutes; whether it should be a body capable of being lifted vertically, or whether it should be tilted at one end or possibly tilted and the body dumped to the ground as is occasionally necessary in handling soft coals. All these types of body equipments on machines are in use, as well as the scheme of handling a large quantity of coal on the semi-trailer equipment, which has the advantage of transporting the greatest portion of the weight over ordinary large diameter wheels with steel tires, but the final determination as to what class of body will be selected must be determined by the particular operating conditions for which the machine is intended.

It is certain that larger loads of coal can be transported by machines than by horses, and in very much less time, but sometimes the delivery conditions of the operator pre-

*Paper read before Retail Coal Dealers' Association of New England, at Boston, March 14.

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vent him from utilizing the larger sizes of machines in view of the fact that his deliveries are to be made in smaller quantities. Such a case as this is coped with by the employment of a large machine with several compartments in the body so that any one of two or three portions of the load may be discharged without interfering with the balance.

The problem, therefore, is not whether coal can be transported more cheaply by machines than horses, but whether the existing conditions in any particular case will permit of the employment of the machine to anything like its economic capacity. Sometimes these conditions are unchangeable, and again slight modifications or changes only are necessary in bringing about new conditions which permit taking advantage of the machine's utility.

In many cities coal has to be delivered in the most inaccessible places; sometimes to very small manholes at the edge of the sidewalk, sometimes through openings which are located at the building rather than at the edge of the walk, and in other instances into openings which are in the walls of the building above the walk. It seldom happens, except in industrial institutions, that the coal can be directly unloaded below the place on which the machine stands. Wherever these conditions can be changed so that an inclined inlet or chute can be provided from the machine to the coal pile the quick discharge of the coal from the machine can be accomplished, but this is frequently impossible, and in some cases a form of chain bucket conveyor has been fitted to the machine so that the load may be transferred in this manner to points which are otherwise inaccessible.



Two Types of Coal Bodies in General Use, That at the Right Being Designed for Side Delivery and That at the Left for End Dumping.

Cost of Transportation.

In the matter of securing from coal operators reliable information on the cost of transportation with horse equipment there appears to be considerable difficulty, due principally to the variety of bookkeeping methods, wherever they exist, and the lack of any uniformity in cost a ton or other unit delivered is due to consideration which must be given to the complete inactivity of the equipment during a portion of the year and the variance of activity from one end of the busy season to the other.

Some installations require the maintenance of the horse equipment during the entire year, due to the difficulty found in the selling and replacement, but quite frequently the expense of this all year maintenance is reduced by pasturing the horses in the inactive period. In other cases the horse equipment may be hired out for their service, but in few cases is there any provision for the employment of the vehicle equipment during its inactivity.

The only safe and general way by which the cost a ton can be arrived at is by taking the entire year's cost of operation and upkeep and charging this to the total tonnage transported annually, but we frequently find that only the current charges for the daily operation of the horse vehicles when in active service are charged against the transportation for the current day, and this data alone is the one with which machine operation is compared. Again, we find the reverse condition, as where an installation may be active 26 weeks of the year, while the total cost of the year in bulk is divided by 300 to arrive at the cost a day and this cost a day used as the basis of determining the cost a ton delivered for any day of the 26 weeks. As a matter of fact, the annual cost in this instance should have been divided by 150 to determine the cost chargeable to each active day, and on this basis the cost a ton would be twice that of the former.

Variable and Constant Changes.

The whole problem requires segregation of those charges which are constant whether the vehicle is employed or not, and an additional charge for those items affected by activity added to the first or fixed charge so as to arrive at a true cost of unit performance, whether this latter be based on a tonnage rating or on a ton-mile basis. It is quite possible in determining the operating cost of machines to follow a similar practise of separating the inactive or constant charges from the active charges and the total charge per day thus arrived at should be used in the determination of the cost of delivery per ton or per ton-mile.

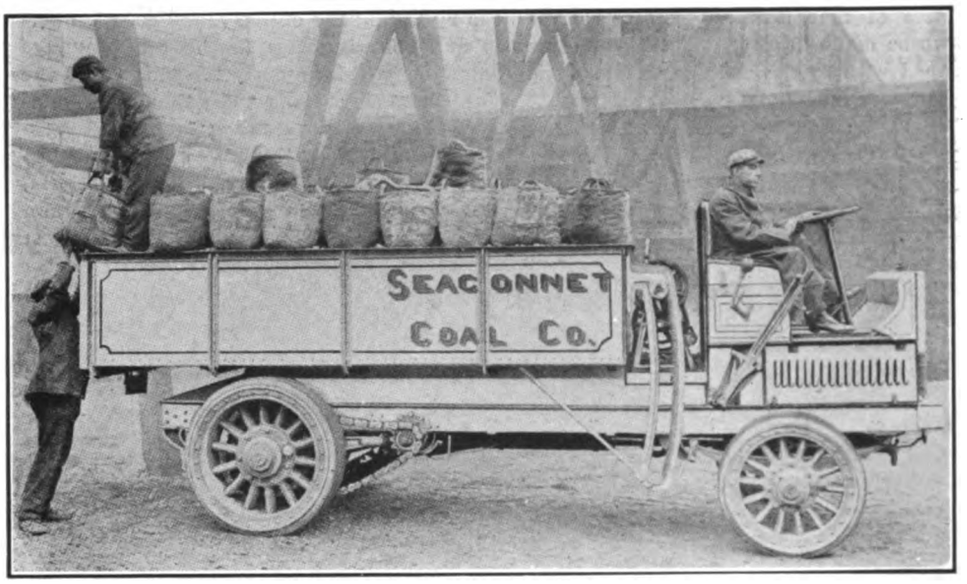
To exemplify this the attached table may serve to show the charges influenced by service or inactivity. The items marked "variable," however, are dependent upon each operator's particular condition and to cover charges for garaging and for operators we have assumed a figure of $60 a month for garage and $20 a week for labor. This table with the total figures shown is intended to cover a year's operation and a performance of 50 miles a day a vehicle.

How Table Is Compiled.

In this table it will be observed that on each size truck there is a figure for fixed charges, which includes interest at six per cent. and a depreciation of 10 per cent. on those parts of the vehicle which are not subject to wear and which are replaced or renewed under the heading of maintenance. Under the maintenance charge there is a figure for the upkeep of mechanical wearing parts and another for tires, and in the operation division there are figures covering consumption of gasoline and lubricating oil, operators and other incidentals to the cost of service.

Assume that we are to determine the cost of operation of a five-ton truck which is employed the entire year. The items for fixed charges, garaging and operators are constant

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Type of Tilting Body, Arranged for Rear Dumping and for Carrying Complex Loads.

and independent of the tonnage or mileage performance of the vehicle. This charge against the vehicle while inactive will amount to $7.56 a day, assuming 312 working days to the year, and the total of the maintenance items, together with the items for fuel and lubrication, can be resolved into a cost of 11 cents a mile, since this example is intended to cover a 50-mile performance each day for 312 days.

Now, with the inactive charge of $7.56 a day and the charge of 11 cents a mile, by multiplying the latter by the mileage performance of the truck on any particular day and adding it to the inactive charge of $7.56 a day we get the total cost for transporting the day's tonnage and in this manner arrive at the actual cost a ton.

Assume that the truck covers 33 miles and delivers 31 tons. Thirty-three multiplied by 11 cents a mile equals $3.63, the active charge, and this added to $7.56, the inactive charge, makes the total cost of the day's performance $11.19, and since this day's performance is the delivery of 31 tons, we divide this figure by 31 and find that the cost a ton is 36 cents. In a similar manner any other performance can be calculated.

In the event of the machine being used only half of the year the fixed charge of $7.56 would be reduced by 50 per cent. of the annual charge for operator and a reduction of the garaging charge during six months to say $5 a month, thus making the fixed charge for the days the machine is rendering service $4.93 instead of $7.56, and consequently, reducing the cost a ton in the particular case cited to 27 cents instead of 36 cents.

If for comparison against such machine cost we have a definitely known cost of transportation a ton with horses, it is quite possible to determine the performance limits of the mileage and tonnage which the machine must accomplish to equal or better the horse cost.

Independent of the higher charges for interest and depreciation which must be made against the machine equipment, it must be recognized that whenever this machine equipment is not being used all the other charges against it cease, with the possible exception of storage, while this is not the case with the horse equipment, which must be fed and cared for almost independent of the service rendered, so that if the machine equipment were not used for six months of the year there might be a considerable reduction in expense over that required to maintain the horse equipment during the same period.

Finally, it should be borne in mind that if there is a long period where the machine is not required for coal transportation and the operator maintains his own garage, it will be quite possible to rent such an equipment at profitable figures in other lines of service, and while assuming control of the garaging and maintenance of the vehicles the owner takes little risk or hazard in leasing the vehicles for such extra service.

It can be readily assumed that such service can be leased at a profit and if this profit is credited against the winter performance cost of the equipment in delivering coal the inactive months of the coal business may thus be made a benefit rather than a detriment to transportation cost by the employment of a motor truck equipment.

GENERAL ANNUAL AVERAGE OPERATING COSTS.

Machine Size	2-Ton	3.5-Ton	5-Ton	6.5-Ton
Fixed Charges—				
Interest on investment @ 6% and depreciation on non-wearing parts @ 10%	$376.00	$458.00	$600.00	$709.00
Maintenance—				
Wearing parts	346.00	420.00	487.00	495.00
Tires	358.00	519.00	757.00	886.00
Garaging—				
Storage, washing, garage labor, insurance (variable)	*720.00	*720.00	*720.00	*720.00
Operation—				
Gasoline @ 10c a gal.	250.00	300.00	375.00	500.00
Lubricating oil @ 35c a gal.	39.00	75.00	105.00	119.00



All Steel Coal Dumping Body, Which Might Deliver to Hole Immediately Under the Truck.

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Operator, helper, licenses (variable)	*1,040.00	*1,040.00	*1,040.00	*1,040.00
	$3,129.00	$3,532.00	$4,084.00	$4,469.00

*Assumed.

Based on performance of 50 miles a day a truck, 312 working days a year.

Total fixed charges, garaging and operator, five-ton truck	$2,360.00
Total fixed charges, garaging and operator, five-ton truck, a day	7.56
Total charges for maintenance, gasoline and oil, five-ton truck	1,724.00
Total charges for maintenance, gasoline and oil, five-ton truck, a day	5.525
Total charges for maintenance, gasoline and oil, five-ton truck, a mile	.11

KNOX EASILY PAYS FOR ITSELF.

The subject of transportation economics is one which is being studied in all its phases by those who are contemplating the introduction of motor haulage. Assistant Sales Manager Charles F. Barrett of the Knox Automobile Company, Springfield, Mass., maker of Knox trucks, is deeply interested in this matter, and cites at least one instance in which a six-ton vehicle paid for itself in one year.

The owner was a large truck concern in a western city, which had a contract to remove all the city garbage, refuse, etc., three miles outside to a reduction plant in the outskirts. For five years this work had been done with horses, and as the concern was contemplating the installation of mechanical transports, very careful figures were kept of the actual cost of operation, including all items, for use as a future basis of comparison.

To do the work successfully with horses, it was found necessary to employ five two-horse teams of three tons capacity each, four of the teams making three round trips daily, or 18 miles, while one team had to make four trips, or 24 miles. Each of the five teams alternated in turn for the extra trip. This arrangement was found to be the most economical for operation with horses, and the daily cost, including all items, such as drivers' wages, repairs, depreciation, interest, etc., averaged over $6, or a total daily cost for the five teams of about $30.

The company purchased a six-ton Knox truck, fitted with 50 horsepower motor. Very liberal allowance was made for tire repairs, depreciation, wages, etc., and the daily cost figured out close to $15. This single truck was easily able to move the entire 48 tons of refuse in a working day of 10 hours, supplanting the five two-horse teams and drivers. It thus effected a saving of $15 a day, or actually paid its own cost, $5200, in 347 working days.

HORSE REPLACED IN CANADA.

One result of the recent automobile shows in Canadian cities is the increased interest in motor trucks throughout the Dominion. Fred J. Titus of the American Locomotive Company, New York City, maker of Alco cars, recently returned from an extensive trip throughout this district, reporting $71,000 in sales within two weeks. He tells of two veteran horse users who have decided to replace their old equipment with modern motor trucks.

J. B. Smith, head of a large lumber concern, who has utilized horses for 60 years and is famous throughout Canada for the fine type of draft animals in his service, has bought four mechanical transports, which he will equip with hydraulic lifts for moving lumber on and off the vehicles. James Crow, another well known horseman, whose animals have taken many blue ribbons at the New York horse shows, has given up dealing in horses and taken an agency for motor cars and trucks.

Mr. Titus also reports that considerable interest is being taken in an endeavor to use wood block tires instead of rubber. Oak is used almost exclusively in this connection, and the entire country is deeply concerned with the result of the tests now under way.

HARRY W. GRIFFITH PROMOTED.

Harry W. Griffith of Indianapolis, Ind., who has been the secretary-treasurer of the Remy Electric Company, Anderson, Ind., well known maker of ignition and lighting specialties, has been appointed general manager in place of W. R. Poland who has resigned to affiliate with a new company which has been organized in Anderson for the manufacture of self-starters for motor cars. Mr. Griffith has had a long experience in the manufacturing business, having been connected with the American Creasoting Company of Chicago prior to joining the Remy concern. His many friends will be pleased to learn of his promotion.

SHAWMUT TIRES AT BOSTON SHOW.

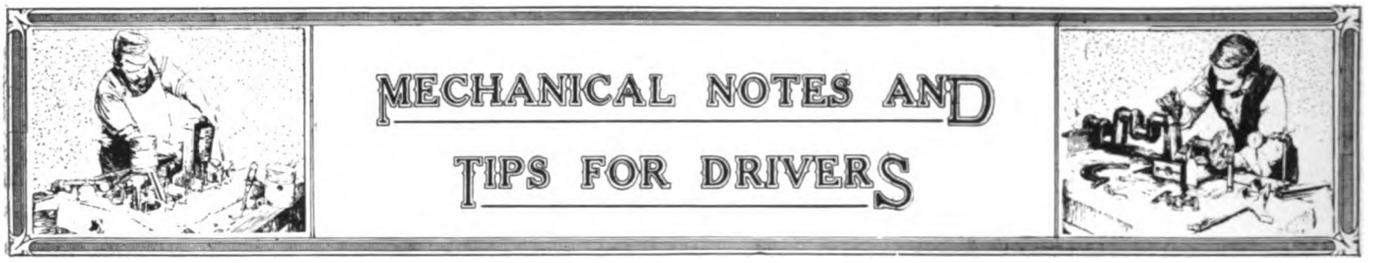
One of the most educational exhibits among the accessory displays at the recent initial Boston motor truck show was that conducted by the Shawmut Tire Company of that city. At this space was seen the whole process of making tires from rubber. The rubber tree was presented, and the method of sapping it, as well as the large biscuits of pure rubber, the form in which the product is shipped to this country. Shawmut tires also were shown in all the different stages of construction.

ADAMS TRUCK SAVES MONEY.

The Adams Bros. Company, Findlay, O., is in receipt of figures from an owner of one of its one-ton vehicles. According to this statement the truck is doing the work of three two-horse wagons, at a saving in cost of equipment of $442.75, and in operating expense of $2567.98. The actual figures follow:

Investment, Horses—		
Seven horses @ $350 (based on one extra)	$1750.00	
Three wagons @ $275	825.00	
Three double harnesses @ $65	195.00	
Seven blankets @ $2	14.00	
Seven halters @ $1.25	8.75	
Total		$2792.75
Investment, Truck—		
Model A, Adams one-ton truck	$2100.00	
Express body and top, plus freight	250.00	
Total		$2350.00
Saving on investment		$442.75
Operation, Horses—		
Three drivers @ $70 a month	$2520.00	
Stable, feed, veterinary, etc.	2268.00	
Repairs and painting, wagons	135.00	
Repairs, harnesses	24.00	
Interest on investment @ 6%	167.57	
Depreciation on horses @ 16.6%	291.66	
Depreciation on equipment @ 15%	156.41	
Total		$5562.64
Operation, Truck—		
Driver @ $75 a month	$ 900.00	
Helper @ $60 a month	720.00	
Gasoline, five gallons a day @ 14 cents	210.00	
Oil and grease	40.00	
Repairs and painting	300.00	
Oil for lamps and incidentals	20.00	
Tire maintenance	200.00	
Garage	72.00	
Interest on investment @ 6%	141.00	
Depreciation @ 16.6%	391.66	
Total		$2994.66
Saving on operation		$2567.98

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REMOVING CARBON FROM CYLINDER.

Carbon deposits on the piston head and in the combustion chamber not only cause a loss of power but an excess of the matter is productive of premature ignition and a noisy motor. Where a large quantity of lubricant is fed to the engine, carbon accumulates very rapidly. It should be removed and the operation does not require the removal of the cylinder as the burnt matter may be cleaned from the head of the piston by utilizing a scraper which may be constructed easily from a piece of .25 or .3125 inch soft steel. The ends of the metal are flattened in a forge and bent hoe shaped, after which the edge is sharpened by grinding on an emery wheel or grindstone.

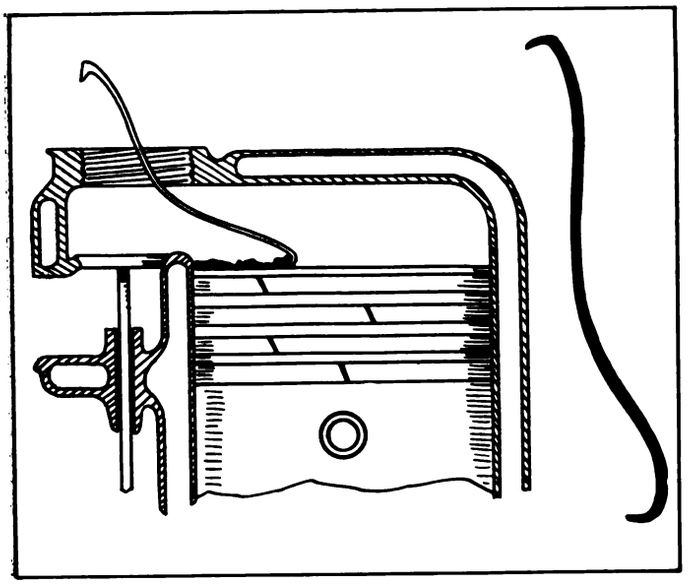


Fig. 1—Depicting How Carbon May Be Removed from Cylinder with Home Made Scraper.

At Fig. 1 is depicted the tool and the method of operation. The valve cap is removed, the piston brought up to the top of its stroke by cranking and the scraper inserted. The latter may be bent to obtain the desired angle, and by means of the sharp ends of the scraper the carbon loosened and removed.

Sometimes it is advisable to remove the cylinders; in fact, many operators who take care of their own machines make it a practise to clean the carbon out of these members at stated intervals, this depending upon the time the car has been in service. The removal of the cylinders is an easy matter but in taking off the rings to get at the carbon back of these members the novice is apt to break the rings, which are brittle.

At Fig. 2 C is shown a method of utilizing old hacksaw blades or smooth strips of metal. Three or four are necessary and these are slipped between the ring and piston proper, as shown in the sketch. This will permit of drawing the rings off without danger of damage. The top ring should be removed first and the remaining members in order. In replacing them, the lower ring should be sprung slightly and slipped over the head of the piston and the blades inserted. The ring is then pushed downward and slipped into the recess. The next ring is replaced and the operation repeated until every one has been fitted.

Care should be taken to note that the openings of the rings do not come in a line. If they are of the pinned type this precaution will not be necessary but otherwise they should be so arranged as to prevent the loss of compression.

Replacing the cylinders will bother the novice and unless care be exercised one or more rings will be broken and the fingers injured. While one familiar with this work can put back a cylinder alone, the amateur repairman should have assistance. With a helper to hold the cylinder and the workman to compress the rings the operation will be accomplished easily.

There are several methods of compressing the rings so that the cylinder will slide over. Some employ a string, but a better method is to make a clamp such as depicted at B. This should be constructed from a piece of flexible metal .125 inch thick and about .5 inch wide. It should be an inch or more longer than the circumference of the piston and when bent into a circle as shown, should be slightly less to enable the device to compress the ring flush with the piston.

To use the tool, it is placed over the top ring, compressed with a pair of pliers and held while the helper slides the cylinder downward, which operation will move the ring holder at the same time, allowing the cylinder to pass over the ring. The operation is repeated until all of the rings are in position. If the operator desires to do this work without assistance, the ends of the holder may be tapped, drilled and fitted with a screw and locking nut. This will enable the workman to clamp the ring so that its upper part is exposed. The cylinder is then slid over until it comes into contact with the clamp. The latter is then released and placed over the next ring and the operation repeated.

TRUING UP COIL POINTS.

To obtain efficiency from a coil it is essential that the platinum points be kept clean as well as that they should seat properly. When these members are so adjusted that the strength of the current is in excess of amount stated by the maker of the coil, the metal will burn or fuse and the surfaces of the points will be pitted and uneven. When these conditions exist considerable more electricity is required to overcome the resistance set up. This not only wastes current but the operation of the motor is affected.

There are several devices for truing up the points, such as jigs, etc. Some utilize a velvet file, but it is difficult to remove the rough places evenly and in addition, a considerable amount of the platinum is likely to be wasted. With the methods outlined it is necessary to remove both the upper and lower parts to do the work properly.

A simple and efficient repair and one that may be made without displacing the parts is shown at Fig. 2 D. It consists of a strip of fine emery paper placed between the two points as shown. The work will require two operations, that of the treating the upper point first, then reversing the paper and smoothing the lower point. The paper should be held perfectly horizontal. The adjusting screw

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should be turned down so that the points grip the paper slightly. All dust or dirt should be removed after the operation and the units readjusted. To obtain the best results from a coil the tension of each vibrator should be the same, each drawing the same amount of current and this may be brought about by the use of an ammeter.

RADIATOR CAP DEVICE.

The commercial vehicle is subject to constant vibration owing to its being operated over rough pavements, and if the driver is careless in replacing the radiator cap after replenishing the cooler with water, the cover is apt to jar loose and be lost on the road. These members are more or less expensive and to prevent their loss may be fitted with a safety device such as illustrated at Fig. 2 A. These are inexpensive and may be constructed by anyone possessing a slight knowledge of the use of the soldering iron.

A small length of chain is attached to a loop or ring and the latter soldered to the cap. The other end of the chain is equipped with a bar and this should be slightly longer than the diameter of the opening in the cooler. The function of the bar is obvious. When it is dropped into the radiator its length being greater than the size of the opening it cannot be withdrawn while in a horizontal position. In the event of the cap working loose, it will be held by the chain and the attention of the driver will be drawn to the member by the rattling of the cap against the radiator.

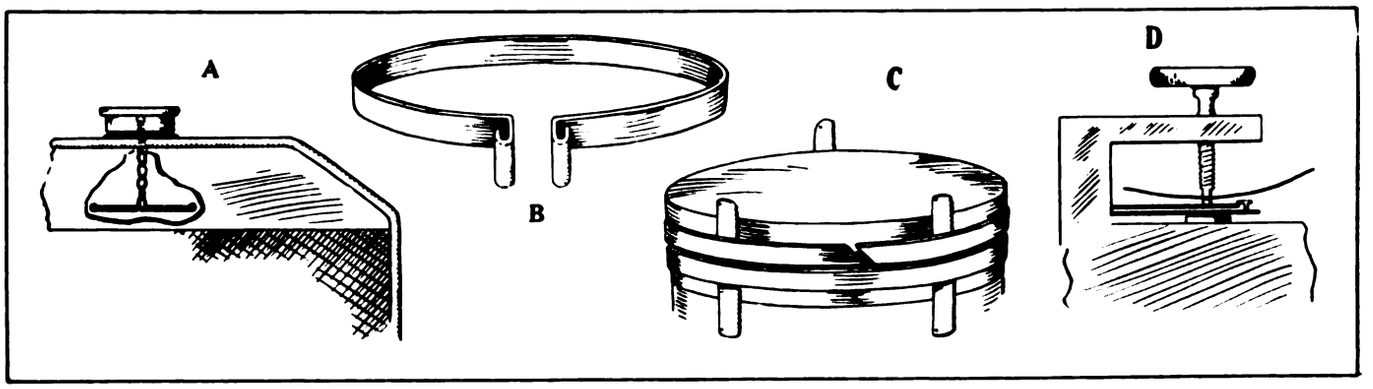


Fig. 2—Some Hints for Operators: A, Safety Device to Prevent Loss of Radiator Cap; B, Piston Ring Clamp; C, Utilizing Old Hacksaw Blades to Remove Piston Rings; D, Truing Up Coil Points with Emery Paper.

STARTING ON MAGNETO.

The majority of commercial vehicles are equipped with a dual ignition system, this consisting of dry cells or a storage battery and a magneto. When the latter is of the true high-tension type care should be exercised when attempting to start the motor with this member. The starting handle should be pulled up smartly, and this should be done with the left hand if the operator be right handed. Some drivers who spin the starting crank make it a practise to push down with the right hand, imparting a rocking motion to obtain inertia enough to swing the handle over, in other words, to overcome the resistance of the compression.

This is dangerous as owing to the construction of the magneto the current generated and built up reaches its maximum at a certain position of the armature and if the starting handle be rocked far enough a spark will cross the gap at the spark plug, exploding the mixture before the piston reaches the top of the compression stroke. The result will be what is termed a backfire and the operator is liable to be injured.

Magnetos are generally so timed that the spark takes place before the piston has reached dead centre and sometimes this advance is more marked. Owing to the fact that there is no lag in the action of the current as with a coil, it is obvious that a backfire is brought about more easily. If the carburetor be adjusted properly and there is no leak in the intake pipes, a true high-tension magneto will start a motor on a quarter-turn of the starting crank.

TESTING EMERGENCY BRAKES.

It is an excellent idea to try the emergency brakes occasionally to note if these members are working properly. Some drivers think that because they hold enough to prevent the car from moving after it has come to rest the brakes are in perfect order. They should be tested while on the road and if they do not grip well should be adjusted. Sometimes the members have been dragging, wearing the lining to such an extent that when the lever is moved the friction set up is not sufficient to check the momentum of the machine.

LIGHT HAMMER BEST FOR RIVETING.

Rivets are commonly used in relining brakes, clutches, etc., and the novice is apt to select a heavy hammer for peining over the head, wondering why he is not successful. The proper tool is a light hammer with which a number of light blows are struck, spreading out the end as desired. If a rivet were held rigidly in a tight hole a heavy blow would expand only the projecting end, but it is not usually so held, and the tendency of the heavy blow is to displace and force apart that which is desired to bring together firmly.

HANDY SPARK PLUG BRUSH.

In cleaning spark plugs it is customary to utilize a brush with stiff bristles and gasoline. These members may be purchased at a supply house and are inexpensive. A handy brush may be made, however, by taking a small piece of .25-inch brass or copper tubing and bristles from an old brush. The bristles are inserted in the tubing and the ends of the latter compressed.

CARE OF LUBRICATORS.

The lubricating system of the motor should be given care and cleaned occasionally. The majority of the makers fit screens for the purpose of filtering the oil and these members become clogged and the flow of the fluid affected thereby. In cleaning the lubricators these screens should be removed and inspected, and if dirty washed with gasoline and replaced at the same time the crankcase is cleaned.

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ELECTRIC VEHICLE BREVITIES

During the Chicago commercial vehicle show the Waverley Company, Indianapolis, Ind., received word from its New York representative that an order for 10 light delivery wagons had been placed by the Fleischmann Company of that city. A few days later a repeat order was taken, making a total of 20 contracted for by that company. The order was placed after long experiment with a Waverley in competition with other types of vehicles, and the maker naturally was elated.

The light electrical transport is adapted for the yeast industry, as many stops are made in delivery, and the simplicity and ease of operation appeals to houses which maintain several vehicles for distributing a large number of packages in certain areas.

In the accompanying illustration is depicted one of the cars ordered by the Fleischmann Company and these are manufactured in two models, of 600 and 1000 pounds carrying capacity, respectively. The lighter machine has a length over all of 125 inches with a wheelbase of 87 inches. The inside body dimensions are three by four by five feet. Wheels, both front and rear, are fitted with 32 by 2.5-inch solid Firestone tires. The batteries are constructed in



One of a Fleet of 20 Light Delivery Electric Vehicles Recently Sold to the Fleischmann Company, New York City, by the Waverley Company, Indianapolis, Ind., Through Its New York Representative.

small units making for easy handling and these are the 28-cell type, 13 MV Exide Hycap, the same size Waverley or National. The maximum speed is 15 miles an hour and the mileage on one charge of the batteries from 50 to 80 miles, this depending upon the roads.

The motor is 60-volt and drive is by shaft. A continuous torque controller is utilized with four speeds forward and reverse. Two sets of brakes are provided, both expanding, on the rear wheels and countershaft. Full elliptic springs are fitted both front and rear and the front axle is of the I beam section type while a full floating type is utilized in the rear. The frame is of armored wood, and roller bearings are employed. Control is at the left and the vehicle is equipped with storm front and side curtains with celluloid windows.

The Edison Electric Illuminating Company of Boston is erecting what is said will be one of the largest garages in the country on the old Boston College athletic field on Massachusetts avenue, and the structure is to be a part of the great service plant that the company is building. It will face Massachusetts avenue at a slight angle and will have a depth of nearly 340 feet and a width of 110. The front part will be three stories in height and the rear but one, and these sections will be separated by a wall. Originally it was the intention of the company to utilize the front building for a stable and the rear for a garage, but before ground was broken it was decided to eliminate the horse drawn equipment and employ automobiles.

The front building will be used for gasoline vehicles and will provide accommodations for about 50 cars, it being about 110 by 80 feet. The ground floor will permit of the storage of 30 automobiles and all of the modern facilities for washing, polishing, etc., will be installed. The second floor will be devoted to the use of the drivers and their equipment, and in addition will provide space for about 20 vehicles. The repair and paint shops will be located on the third floor and will be completely equipped for the care and maintenance of mechanical transports.

The electric garage will be 110 feet wide and about 250 feet deep, all on one floor with entrances on the sides and ends. It is stated that four rows of machines may be stored easily besides providing plenty of space for working around the cars. There will be the usual facilities for washing, etc., and modern equipment for charging batteries as well as apparatus for removing and replacing these members.

The stock building of the company is to be located next to the garage on one side and here all supplies except the heaviest will be carried. There will be a street between the garage and stock building and it will be covered with glass, the idea being to make it possible to load the machines with the greatest dispatch, much of the loading being done at night, so that each automobile will be ready for service in the morning.

Four doors in the side of the garage provide means for the machines to run across the street to the loading platforms of the stock building. Beyond the latter will be another structure in which heavy parts will be stored. The group of buildings will be supplied by electricity from a transformer station beyond the second stock structure. Merchandise will be received from the railroad by a spur track. It is expected that the plant will be ready for occupancy late this year.

The Revere Rubber Company, Revere, Mass., is replacing its horse drawn equipment with the more modern mechanical transport and has placed an order with R. M. Thurber of the Boston sales office of the General Vehicle Company of Long Island City, N. Y., for a fleet of 3.5 and five-ton trucks. These will be utilized for transporting heavy loads between the factory at Revere and Boston. Mr. Thurber, who secured the order for which competition was unusually keen, is very much elated with his success in placing electric vehicles.

Announcement is made by the Baker Motor Vehicle Company, Cleveland, O., that William P. Kennedy, the well known consulting electrical engineer of New York City, will act as superintendent of the bureau of service efficiency for that company. Mr. Kennedy has for some time been affiliated with the Cleveland concern as its consulting transportation service engineer. He has had a broad experience and possesses a deep knowledge of the subject.

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Delivering electric meters in a large city is a difficult and delicate task but the problem of safely transporting these members, which have to be handled carefully owing to their finely balanced mechanism, has been solved by the New York Edison Company of New York City, which concern maintains a fleet of electric vehicles. In the accompanying illustration is depicted three of the numerous cars utilized by this company, and these are Detroits, made by the Anderson Electric Car Company, Detroit.

They are stock models, but an interesting feature of the body construction is the fitting of nests for carrying meters. The latter are injured easily and the company formerly utilized rubber matting to absorb the road shocks and to eliminate vibration which has a tendency to cause the meters to register inaccurately.

The idea of constructing compartments or nests was originated by a member of the meter department who noticed a baker's wagon in which the pies were carried in separate compartments so built that the pastry was held securely. The plan was copied and the bodies of the automobiles were fitted with racks on either side of an alley way. Each compartment was fitted with a cushion which covers the floor and part of the walls and drops over the sill, so that once a meter is placed inside it is safe and secure. Each machine carries 42 of these nests in addition to the equipment for installation.

The New York Edison Company formerly divided the island of Manhattan into three districts with a meter storehouse in each and all meters required were transported from the main station at West 39th street. This system was abolished as were the branches, this being made possible by the use of the electric automobile. The main station was retained and this has a capacity of 20,000 meters, these being transported by the machines, which are loaded in the afternoon and start out the following morning, delivering directly to the different jobs ahead of the wiring crew. This saves considerable time in the installation and the customer is benefited thereby.

The machines employed have a carrying capacity of 3000 pounds and weigh approximately 4500. Edison batteries of nickel and steel construction are utilized, these being free from sulphation, leaky jars, and are not affected by the vibration set up in traversing rough roads. These have 60 cells with the Edison A6 for light and A8 for heavy service. The normal voltage of the motors, which are of the series wound type, is 70, and the normal amperage 48. Hess-Bright annular bearings are employed, and the brushes are well mounted, of special design and liberal area.

The drive of the first reduction is by Renold chain and second by roller chain. The gear ratio is 11.55 to one. A continuous torque drum type of controller is employed, the contact fingers of which are held under tension by laminated springs. The reverse switch is the improved laminated type, mounted with the controller and an interlocking device of simple construction is fitted, preventing the possibility of the driver "bucking" the motor, it being necessary to bring the controller into neutral position before changing the current directions. Oilers are provided at all bearing points.

The brakes are two in number, located on the rear wheel hubs and countershaft, and operated by pedal. The front wheels are 34 inches in diameter and rear 36, these being fitted with Timken bearings and the solid tires are 34 by 2.5 inches front and 36 by four rear. The wheelbase is 96 inches, tread 62 and road clearance 11.5. The overall dimensions are: Length 155 inches, width 74, height 100. The speed an hour loaded is approximately 11 miles an hour and mileage 40 and 55 with the light and heavy service batteries, respectively.

A Sangamo ampere-hour meter is a part of the regular equipment. This instrument is a regular battery gauge, and gives correct information as to the current the battery contains, also affords opportunity for daily records. The new Veeder gearless hub odometer is furnished, also such extras as inspection lamp, tools, etc.



Trio of Detroit Electrics, Made by the Anderson Electric Car Company, Detroit, in Service with the New York Edison Company—The Bodies Are Equipped with 42 Nests for Transporting Meters.

That the electric vehicle is meeting with favor with express companies is noted by the large number of orders being placed with the General Vehicle Company, Long Island City, N. Y. Many of the purchasers repeated their orders and an instance of this kind is noted in the case of the American Express Company, which placed a number of trucks in service at its Boston department. In addition a contract was made with the General Vehicle Company for 25 3.5-ton trucks for the New York branch. This large order was followed recently by another for 20 two-ton and three 3.5-ton machines, which will be utilized in one of the cities. Among the express concerns repeating orders is the Adams Express Company, which recently contracted for a large number of electrics. The New York Transportation Company, which is known to many as Dodd's Express, has repeated its order for three 3.5-ton trucks.

Figures showing the actual performance and cost of

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commercial vehicles are of interest to those contemplating the installation of the mechanical transport. The Baker Motor Vehicle Company, Cleveland, O., has, through its transportation service department, compiled figures showing the performance of a fleet of eight electrics in service with a large department store. The data comprise a daily chart of the service afforded and its total cost for two months by days, the cost being operating expenses, plus depreciation, insurance, repairs, interest on investment, etc. The months taken were November and December, the former when the machines were operating under normal conditions, and the latter during the holidays. During November the cars averaged 36 miles daily and the average of packages delivered daily was 164, and at a cost of 4.03 cents a package.

During 26 days of service in December the machines averaged 35 miles a day, delivered an average of 247 packages and at a cost of 2.7 cents each. The largest number of deliveries made in one day was 401, and 34 miles were travelled, while the biggest mileage was 50, when but 195 packages were delivered. The figures follow:

Date	Mileage	No. Packages	Date	Mileage	No. Packages
Nov. 1	34	169	Dec. 1	33	164
Nov. 2	37	172	Dec. 2	40	170
Nov. 3	35	153	Dec. 3	47	183
Nov. 4	31	170	Dec. 4	12	142
Nov. 6	45	145	Dec. 5	50	195
Nov. 7	27	208	Dec. 7	34	208
Nov. 8	52	142	Dec. 8	27	227
Nov. 9	33	167	Dec. 9	30	240
Nov. 10	41	130	Dec. 10	41	243
Nov. 11	56	123	Dec. 11	33	198
Nov. 13	34	175	Dec. 12	38	204
Nov. 14	43	150	Dec. 13	30	260
Nov. 15	30	213	Dec. 15	27	314
Nov. 16	22	230	Dec. 16	32	348
Nov. 17	32	214	Dec. 17	44	264
Nov. 18	46	174	Dec. 19	25	309
Nov. 20	34	145	Dec. 20	26	332
Nov. 21	37	143	Dec. 21	32	280
Nov. 22	35	210	Dec. 22	40	196
Nov. 23	40	121	Dec. 23	21	263
Nov. 24	37	135	Dec. 24	34	401
Nov. 25	34	163	Dec. 27	42	307
Nov. 27	32	112	Dec. 28	45	277
Nov. 28	30	174	Dec. 29	43	209
Nov. 29	26	150	Dec. 30	24	179
			Dec. 31	26	147

Day Baker, New England manager of the General Vehicle Company, Long Island City, N. Y., stated recently that few people in business life realize the volume of business being transacted in the truck line in Boston. He says: "The business public has decided to do its transportation by commercial vehicles, and while the truck is far more economical than any other form of transportation, especially if its form and size be adapted to the particular work, the business man will utilize mechanical transports regardless of the economy of operation. Automobiles are in line with the progress and spirit of the age, and the public is bound to have them, both the electric and gasoline types. The electric vehicle solves the transportation problem in cities and towns, while the gasoline machine is adapted for the long hauls over suburban roads. In cities, the former type is handled more easily and the cleanliness of the electric appeals to many. The recent exhibition at Boston will have a very potent influence upon the commercial vehicle transportation in New England."

Following the example of Boston, the railroad authorities at Springfield, Mass., have decided to try an automobile baggage truck operated by electricity. The experiment proved so successful in the former city that the vehicle was shipped to Springfield for a trial and if it demonstrates its practicability, as it has in a number of cities, will be made a permanent fixture. The machine is known as the double decker type having two surfaces 42 by 85 inches, one above the other on which baggage may be deposited. It has a back which may be used for another extension of the lower plane to a trifle over 10 feet. Its carrying capacity, 2000 to 4000 pounds, is considerably greater than that of the ordinary hand trucks and it has a speed which can be regulated from two to 10 miles an hour.

The Baker Motor Vehicle Company, Cleveland, O., maker of Baker commercial and pleasure vehicles, is issuing a neat folder in colors which depicts a fleet of 50 cars in service with the American Express Company of New York City.

The city of Alliance, O., is a progressive municipality, and conducted a series of experiments with the different types of automobiles to secure a vehicle best adapted for a combination police patrol and ambulance. The committee in charge of the tests decided upon the product of the Argo Electric Vehicle Company, Saginaw, Mich., maker of electric commercial and pleasure vehicles of all types.

REPEAT ORDER FOR SAMPSON TRUCK.

After experimenting with the motor propelled vehicle for 15 months, the Mosler Safe Company, New York City, has ordered a second machine which will be similar in every respect to the first car. The Sampson power wagon, made by the Alden Sampson Manufacturing Company, Detroit, a constituent of the United States Motor Company, New York City, will be fitted with windlasses operated by the power of the motor, enabling the crews to lift the heaviest safes in much less time than with hand power.

COAL DEALERS DISCUSS MOTOR VEHICLES.

The Maine Coal Dealers' Association held its annual meeting recently, at which the various cities and towns were represented. A feature of the session was the address upon modern methods of handling coal by W. A. Clark, president of the New England Coal Dealers' Association. The practicability of the mechanical transport was pointed out by the speaker, and the various loading and unloading devices outlined.

BARKER HEAVY DUTY TRUCK.

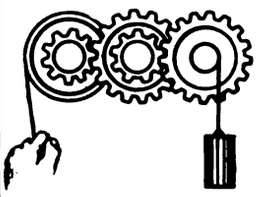
Charles L. Barker, Norwalk, Conn., maker of marine and stationary gasoline motors, is now manufacturing three and five-ton commercial vehicles which are to be known as the Barker Heavy Duty truck. Of the design is emphasized its simplicity, durability and accessibility. The power plant is stated to be sufficient to handle the heaviest of loads. The clutch is a multiple disc and the transmission provides a direct drive on the second and third speeds. Final drive is by chain, fully enclosed. A feature of the design is a dash fuel tank with emergency member.

G. M. C. FOR QUICK TRANSPORTATION.

The keen business man can find many ways of saving time when supplied with the modern motor truck. Gleeson Murphy, vice president of the General Motors Truck Company, Detroit, cites the instance of a contractor in Natick, Mass., who owns a 3.5-ton G. M. C. truck. Instead of waiting for teams to move his tools and other building material, and sending his men on the next job by train, he simply loads the entire outfit into the vehicle and away he goes. Recently, he moved his equipment and men 24 miles and was on the new job in three hours. On another occasion, he finished some work at 2 in the afternoon, loaded his men and tools, shifted to another city 75 miles away, and began work on the new job the next morning at 7.

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RECENT MOTOR VEHICLE PATENTS



Hunt Motor Truck.

Charles W. Hunt, deceased, New York City, has been granted a patent for a motor truck consisting of a driving axle and wheels, a carrying axle and wheels and a frame. Motor frame is independent of usual frame member and has a two point bearing on the driving axle and a single point bearing upon the carrying axle, extending beyond the driving and away from the carrying members. The motor is mounted upon the extension and its weight acts upon the driving axle with a minimum leverage.

Lent Fire Engine.

An automobile fire engine has been patented by Leon B. Lent, Brewster, N. Y. It is similar to the usual four-cylinder pleasure motor car with the exception that a rotary pump is mounted amidships on the frame. The transmission is fitted between the main driving shaft and rear wheels, and a shaft operates the pump member by a wheel which serves as a flywheel for the motor. The impeller is permanently mounted upon this shaft which also serves as a driving member for the vehicle.

Long Horn.

An automobile horn which is operated by hand has been invented by Robert E. Long, New York City, to whom a patent has been granted. It is similar in shape to horns having a diaphragm and the plunger rod may be fitted at the top or end. When this member is depressed it actuates a gear which in turn operates another toothed member engaged with a number of striking members, these carrying several balls rotatively mounted in perforations adapted to strike on projections rigidly mounted on the diaphragm when a weighted rotary disc in its vicinity is operated.

Bishop Muffler.

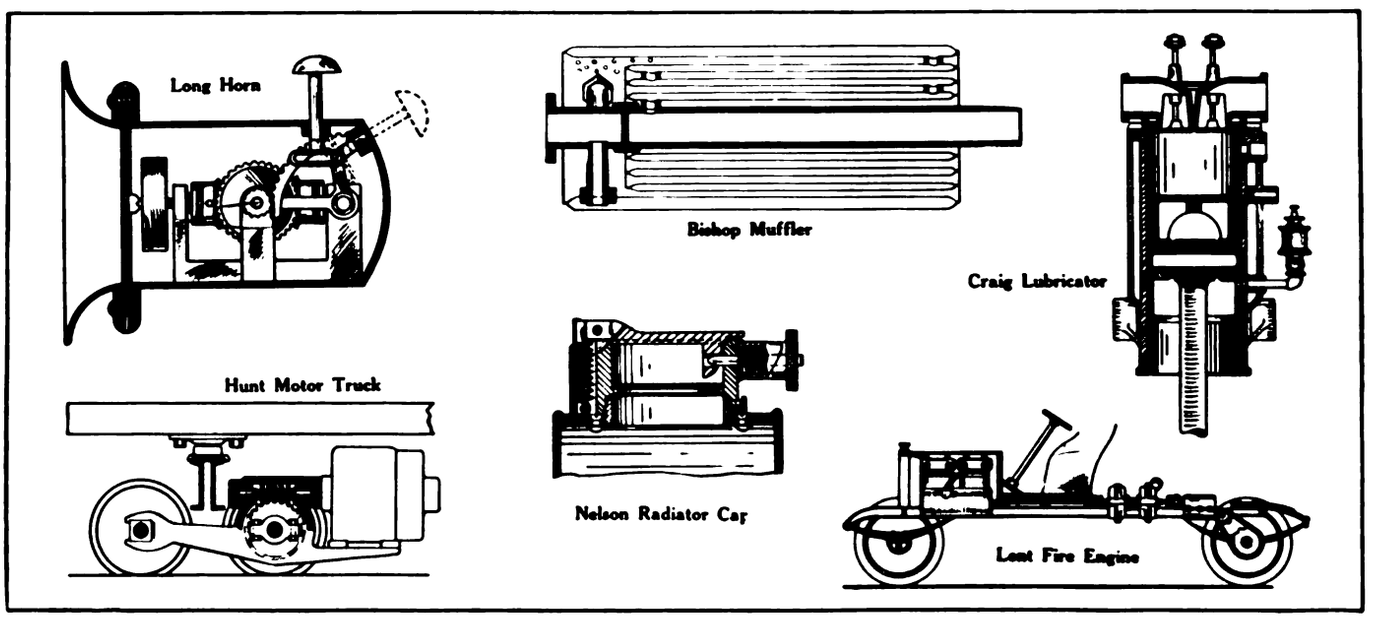
George Arthur Bishop, Leeds, England, has been granted a patent for a muffler which comprises a gas inlet pipe surrounded by a series of annular chambers with closed ends and so arranged as to provide cooling spaces between them. Inlet and outlet ports are provided near opposite ends of these chambers, also radially extending tubular distance pieces connecting the outlet ports of the pipe with the inlet members of the first of said chambers, and radially extending tubular distance pieces connecting the outlet ports of each chamber, except the outer one, to the inlet ports of the next adjacent chamber.

Craig Lubricator.

A device for lubricating the wristpin of a piston has been invented by James Craig, New Rochelle, N. Y. Lubricant is supplied by a cup through a passage in the cylinder wall to an annular cavity in the piston. The fluid is led through a port to a groove in the wristpin which is fitted with a chamber and means are incorporated for lubricating the upper and lower surfaces of the pin.

Nelson Radiator Cap.

When an operator of a commercial vehicle is careless in replacing the radiator cap after replenishing the supply of fluid, it is liable to be lost owing to the vibration set up in traversing rough roads. Edmund B. Nelson, Cadiz, O., has invented a radiator cap which presents many practical features inasmuch as its construction is such that the member cannot be lost and considerable time is saved in filling a cooler as unscrewing the cap is avoided. The device consists of a lid pivotally mounted or hinged and fitted with a spring for the purpose of throwing the lid open when the spring member is released. The latter is concealed and attached to the lid is a perforated lug extending downward into which fits a spring actuated pin. This is provided with a cam face mating with a similar member of the cylindrical casing whereby when the knurled head of the pin is turned the pin itself will move outward, releasing the lid.



Some Recent Patents of Interest to the Commercial Vehicle Operator, Manufacturer and Dealer.

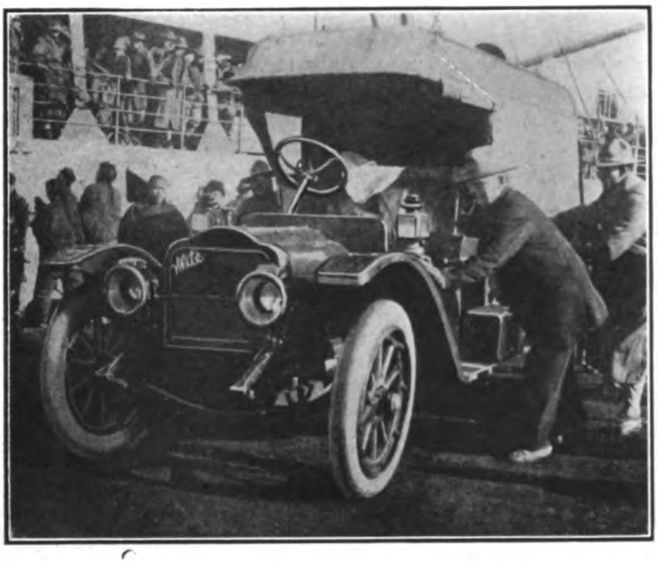
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FOREIGN TRUCK NOTES OF INTEREST

WHITE TRUCK IN CHINA.

The progressive ideas with which the present government of China seems to be imbued are expected to result in opening a decidedly successful market for all types of modern equipment, including, of course, the pleasure and commercial automobiles. Pleasure cars have been in more or less constant service in certain sections for some time, but it is only recently that motor trucks have been seen in China.

Among the first was a White, made by the White Company, Cleveland, O., one of the vehicles utilized by the United States army in the Philippines. When the American forces were sent to China during the recent disturbances, they were accompanied by this machine, which was fitted for all emergencies and did excellent work in connection with the troops of the allied forces.



White Truck Which Accompanied United States Troops to Northern China During Disturbances in That Country Recently.

An accompanying illustration shows the car upon its arrival in Chin Wang Tao, North China, as it was being prepared for its journey inland. As might be expected, it attracted considerable attention from the natives, and it hardly need be mentioned that the Chinese business men found opportunity to watch its progress in the difficult task before it.

SPLENDID MARKET IN JAPAN.

The business men of Japan have been investigating the commercial vehicle with the result that they are rapidly becoming convinced of its thorough practicability and efficiency. The roads in that country are not such as to indicate the most successful operation of mechanical transports, but the government is committed to a policy of remedying these conditions as rapidly as possible. Several machines of British manufacture have been utilized with very satisfactory results, and the Japanese are about prepared to purchase in increasing quantity.

Vehicles destined for use in Japan should be capable of hard wear. The roads in some of the mountainous districts are exceedingly bad, and there is a decided scarcity of experienced chauffeurs and mechanics. On account of the narrow city streets, cars ought to have short and narrow bodies, easily steered front wheels, strong brakes and durable rubber tires. The manufacturer who develops this field in the proper manner is sure to secure a permanent market.

PROPOSED SOUTH AFRICAN TARIFF.

As chronicled in these columns recently, business men and farmers in South Africa have become convinced of the utility of the motor vehicle and are prepared to purchase on a satisfactory scale. Closely following this information comes the news that the Union Parliament of South Africa (British) practically has agreed upon a policy to impose a tariff on all motor vehicles shipped to that section. It is presumed that this will include a preferential clause in favor of British made products. However, there is a division of opinion concerning the whole project and the Legislature now has a majority and minority report before it for consideration.

STREET CLEANERS IN PARIS.

As a result of the recent tests conducted by the city of Paris, France, 30 combined motor watering carts and street sweepers have been purchased from the De Dion-Bouton company. The chassis of these machines will be the regulation 18 horsepower type, so generally used on the Continent.

TAXICABS IN BRAZIL.

Germany has been decidedly successful in developing trade in South America, as is evidenced by the recent order for 35 taxicabs received by the Neue Automobil Gesellschaft from a concern operating in Rio de Janeiro, Brazil. These vehicles are of the open type, seating four passengers, and are constructed on the regular N. A. G. 12-14 horsepower, four-cylinder chassis.

FIRE APPARATUS IN IRELAND.

The police committee of the town council in Belfast, Ireland, has approved the report of a sub-committee recommending the expenditure of practically $50,000 in the purchase of modern motor fire fighting apparatus. The plan embraces the entire replacement of the present equipment of horse drawn vehicles, including the steam fire engines.

MOTOR MAIL WAGONS IN BAVARIA.

Beginning last month, a new motor mail line connecting Nuremberg and Erlangen in Bavaria was opened, covering a distance of 11 miles. The city of Nuremberg has guaranteed the success of the enterprise to the amount of practically $900, other interested communities bearing the cost of constructing and maintaining the requisite garages. The municipal authorities of Dachau are interested in a similar proposal concerning a line to Odelzhausen.

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ELECTRICS IN AUSTRALIA.

The city of Melbourne, Australia, has decided to import one or more electrically driven motor vehicles for use by the municipal authorities. This is a type of machine which has been given but little trial in the commonwealth, and many business men are watching the innovation with considerable interest. The Australian market has been decidedly active for gasoline trucks during the past year, and it would appear that manufacturers of electric vehicles would do well to watch the experiment under the direction of the Melbourne officials.

MOTOR HAULAGE IN PATAGONIA.

Owing to the scarcity of grass in southern Patagonia, it is impossible to employ the bullock teams, and those who have been engaged in developing this country have been making tests of motor transports for some time. Practically the first machines imported into this country were two gasoline tractors of American manufacture. The rough roads and the light construction of the vehicles proved to be a combination which did not result satisfactorily. However, a machine of the same make and type is still in use in that country, although the consumption of fuel is admittedly very high.

The Sociedad Explotadora de Tierra del Fuego uses steam tractors on its Ultima Esperanza section with success. Another successful machine is a Fiat, which has been working there for about three years, making frequent trips to Rio Gallegos and Guer-Aike, a distance of 21 miles, and carrying three tons each way.

Two British vehicles, a steam Mann and a gasoline Marshall, are also being used in the same territory. The first operates at a rate of seven miles an hour with a seven-ton load, while the latter frequently makes trips to Guer-Aike, drawing loads up to 25 tons.

It would appear that an excellent field might be developed for specially constructed machines. Despite the absence of grass, other crops are grown easily, and the farmers of that section are anxious to obtain some satisfactory means of hauling their products to market.

AMERICAN AMBULANCE FOR BRAZIL.

An accompanying illustration presents a Pope-Hartford ambulance, made by the Pope Manufacturing Company, Hartford, Conn., for use in Rio de Janeiro, Brazil. The vehicle is much the same as those which have given excellent satisfaction at home. The inside equipment includes beds, stretchers, medicine chest, folding seats for surgeons and nurses, speaking tube from surgeon's seat to driver's seat, and two dome electric lights in the roof.

The chassis is fitted with a 50 horsepower motor. Wheelbase is 136 inches, tires 38 by 5.5 inches in front, and 39 by six inches rear, with demountable rims. The body is of wood, having a floor space of 38 by 93 inches, with inside height of 58 inches. The roof and inside walls are finished in mahogany, with doors on either side and double doors in the rear. These latter have double locks, operated from either inside or out, and each door has a plate glass window 13.5 by 22 inches. Springs are of the finest quality, giving comfortable carriage of the sick and injured.

GERMAN SERVICE IN AFRICA.

Work is progressing favorably on the proposed motor truck line between German East and West Africa, across the Continent and through the Belgian Congo. Considerable construction will be necessary, and a new road must be cut through forests and mountainous country, and bridges thrown across rivers, before the vehicles will be able to make the trip.

NO HORSE CABS IN BERLIN.

Beginning April 1, no more horse cabs will be allowed upon the streets of Berlin, Germany, in compliance with an edict issued by the police authorities of that city. It is maintained that the vehicles in question have become so utterly obsolete as to be wholly unworthy of such an up-to-date city as Berlin. To each of the 60 licensed drivers affected by the new regulation $150 has been paid by way of compensation, and it is announced that their application for permission to operate motor cabs will be considered favorably. This is a step which will be watched with interest by other Continental countries following closely the example recently set in Paris.



Pope-Hartford Ambulance Recently Shipped by Pope Manufacturing Company to Rio de Janeiro, Brazil.

AGRICULTURAL TRIALS IN FRANCE.

The recent agricultural trials in France were not as successful as those in charge had anticipated. The difficulty appears to have been in the failure to attract a sufficient amount of competition. It is announced in this connection that the Societe Nationale d'Encouragement a la Agriculture, having former President Loubet at its head, will undertake the holding of an important agricultural motor congress in 1913, and that manufacturers of farming implements in all countries, not only will be invited, but urged to compete.

A considerable competition is expected in connection with the trials at Bourges from Sept. 25 to Oct. 6, under the auspices of a committee, of which Prince Pierre D'Arenburg is chairman. All particulars are to be obtained from the office of the commission, 14 Avenue de la Gare, Bourges, Cher, or from the secretary of the agricultural committee of the Automobile Club de France, Paris.

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SOLVING THE QUICK LOADING PROBLEM.

Interesting Device Developed for Application with Horse Drawn Equipment, Which May Be Utilized with Satisfactory Results in Motor Vehicle Haulage.

THERE is little disposition to dispute the fact that until the appearance of the practical motor truck, few operators of horse drawn equipment gave the attention to the matter of economical and efficient haulage that its importance warrants. This applies equally to the man who is compelled to rely upon others for the solving of his transportation problem and to those who are engaged solely in the matter of haulage. Only those who have made attempt to gain information upon which to base comparison between the relative cost of mechanical and horse drawn equipment can appreciate the full force of this statement.

Many men hesitate to adopt newer methods in this branch of their business, largely because they are not well informed as to the cost of their present facilities. Draught animals have been employed in hauling materials and goods for many years, but there practically are no data available from which it is possible to learn whether or not their use is costing more today than 50 years ago, for instance.

When the motor truck salesman first approached the business man it was with the argument that he could effect economy. Careful compilation of figures for a given period, based upon the amount of work that a particular vehicle could perform in competition with horses, proved that this was true. But the business man often failed to become convinced, even with the figures before him, and the reason is to be found in the item of efficiency.

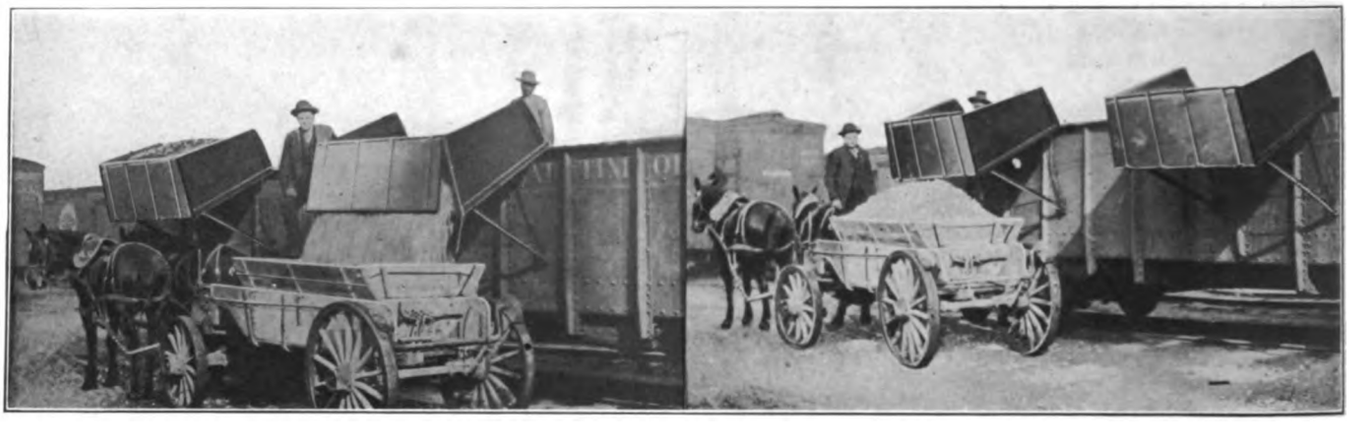
It matters little that a mechanical transport can accomplish more work than horses, if it is not to be worked to something like the limit of its efficiency. It is only under such conditions that it is able to show the maximum economy, and with certain lines of business this becomes a decided problem in itself.

The successful competition of the motor truck has occasioned considerable more thought with respect to the transportation question, even with those who for one reason or another feel compelled to continue with horses. The careful compilations which have been made in recent years have served to inform the business man as to what his horse drawn vehicles should cost, and there is no doubt that this agitation has resulted in endeavor to secure ways and means of improving their efficiency. The owner and prospective purchaser of mechanical transports can learn much from a consideration of some of these innovations.

In accompanying illustrations is presented a quick loading chute, which was produced by the Quick Loading Car Chute Company, Birmingham, Ala., primarily for the benefit of horse owners. Ample demonstration appears to have resulted in increasing the efficiency of the horse wagon by nearly 100 per cent. There seems to be no reason why the same equipment should not work similar, if not more favorable results with motor vehicles.

As indicated, the chute is designed for attachment to cars or bins for the handling of coal, grain, etc., but there are numerous other uses to which it might be put with equal success. Line drawings herewith give a clear idea of the construction. It is made of steel and angle iron and is so designed that it may be hooked to the top of the car by means of two large hooks, which may be attached to the bottom frame of chute at three different points, according to the size of the vehicle to be loaded.

Depending upon the relative heights of the car sides and the wagons, the chutes are adjusted with a chain, by hooking up which the front of the chute is raised, and by letting down it is given greater inclination. It is necessary to fit the hooks securely to the top edge of the car, and not to let the ends rest on the contents. If the car be full, a space should be cleared for this purpose. The curved part of each hook must be in close contact with the edge of the car. If these precautions be taken, the chute is said to be able to sustain double its rated capacity.



Quick Loading Chute in Operation: At Left, Team Beginning to Take on Load; at Right, Wagon Fully Loaded.

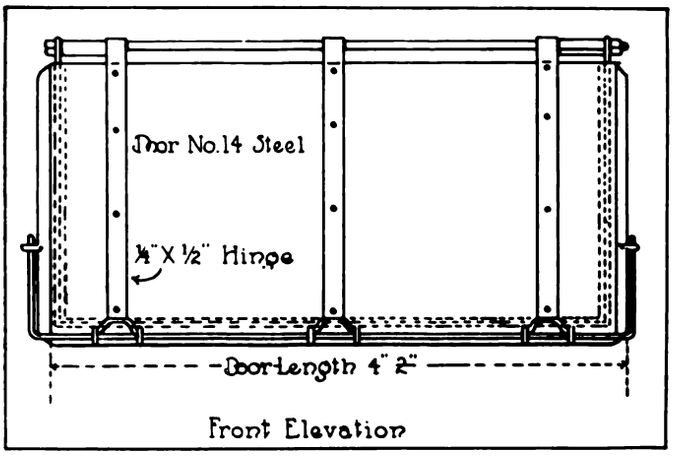
The method of use is obvious from the photographs. Two or more of the chutes are attached to the side of the car or cars, and a man is detailed to fill each. The wagon is placed in position underneath and trap is sprung. As many chutes are dumped as are needed to fill the vehicle, and while this load is being delivered, the men have opportunity to refill the chutes.

By this method, it is possible to discharge the contents of a chute into the wagon in 10 seconds. Assuming that it is necessary to utilize the contents of two chutes, the vehicle is detained less than a minute and may be on its way to deliver the load.

Not only is time saved on the part of the wagon or truck, but there is no waste time on the part of the men who do the shovelling. Under the old arrangement, the men are forced to remain idle during the periods when no wagon is awaiting a load at the car. With the new plan, the men are always busy, and the teams are moving all the time. There is no waiting for wagons and no wagons waiting for loads.

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Still another item enters into the consideration where these devices are used in connection with unloading railroad cars. As is well known, railroad companies are continually



Drawing Indicating Construction of Quick Loading Chute.

demanding the use of their rolling stock, and in order to insure that they shall have such use so far as possible, demurrage charges are collected after a stipulated time, if a consignee is unable to release the car. Any method which will make for quicker work in unloading the contents of a car lessens the possibility of demurrage.

That this is by no means an unimportant consideration, is the better understood when it is stated that many contractors throughout the country are called upon frequently to move from 10,000 to 15,000 tons of one class of bulk freight at a time. More than 250 concerns in 35 states are using the chutes described, as well as many in Canada and the insular possessions of the United States.

Chutes are made in three standard sizes as follows: Capable of holding .75 cubic yard, shipping weight, 216 pounds; one yard, 285 pounds, and 1.5 yards, 324 pounds. The drawings present the exact proportions.

BUSINESS MEN AND TRUCKS.

"The pleasure automobile has been in the foreground long enough," declares T. R. Lippard, vice president and manager of the Lippard-Stewart Motor Car Company of Buffalo, N. Y. "In the automobile business we have seen an instance of the reversal of the old motto, 'Business before pleasure.'

"The pleasure car got the start because it ministered to the pleasure-loving instincts of the people. The motor truck was meant for business purposes, and business men are conservative.

"The merchant who bought a pleasure car and careered joyously through the country is slow to contemplate the abandonment of horses and wagons for the transportation of his goods. The change would involve expense. He would have to dispose of the plant he has, at a sacrifice perhaps, which certainly would be more costly at the outset.

"But he is gradually becoming converted. Though the initial cost of a motor truck may be greater, it is an untiring servant. Unlike the horse, it can work all day long. It is never so galled and footsore that some humane policeman has to order it back to the stable, and it does not obstruct the street like the horse and wagon.

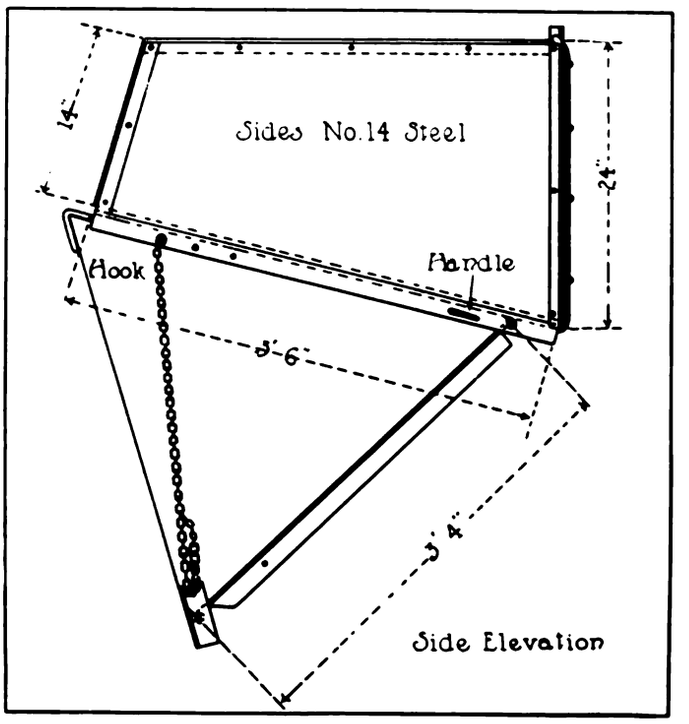
"The public is interested in the motor delivery car, because it will reduce the traffic congestion in cities about 20 per cent. That ought to, but may not, appeal forcibly to the merchant. The saving in money through the motor vehicle must appeal to him mightily, when he has been made to see it."

G. M. C. TRUCK AIDS FACTORY.

The superiority of the commercial vehicle over all other forms of transportation in the case of emergency was demonstrated recently at the plant of the Spink Manufacturing Company in Philadelphia. The power plant was put out of commission by the breaking of a large cylinder and a new one could be procured only at Newark, N. J., a distance of 95 miles. Not wishing to tie up the factory while waiting for the machinery to be shipped by the usual methods, a G. M. C. truck, made by the General Motors Company, Detroit, was dispatched with a crew to Newark. The start was made at 3 in the morning, and in spite of a severe rain and wind storm the car reached Newark at 2 in the afternoon, loaded on the cylinder and started the return trip shortly after 5. By this time the rain had changed to hail and the 3.5-ton machine encountered many difficulties on the return trip. In some places large limbs from trees obstructed the roads, compelling the crew to stop and remove them. The automobile arrived in Philadelphia at 1 in the morning, having covered a distance of 170 miles, and during the entire trip the car ran perfectly.

FUEL ECONOMY IN OPERATING.

That there is a considerable difference in the amount of gasoline used by a vehicle when operated by a competent and an inexperienced driver was proven recently by a novel test conducted by William H. Stewart, Jr., of the Mais Motor Truck Company, Indianapolis, Ind. In the first test the course was covered by a driver using the same judgment as the average experienced man. Then a man was placed behind the wheel and made to drive the same distance after being shown how to operate the car as would be the case in teaching a new owner. The results were very surprising. The experiments showed that 34 per cent. more fuel was consumed by the inexperienced operator than was used by the regular driver. Of course, it will be admitted that



Illustrating Provision for Attaching Chute in Position.

the inexperienced man will soon be able to overcome this difficulty and no suggestion is made that it is necessary to employ experienced chauffeurs for motor truck work.

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ELECTRIC CAMPAIGNERS BANQUET IN BOSTON.

Manufacturers Discuss Some of the Reasons Why This Type of Vehicle Has Failed of Adoption in New England and Suggest Methods for Increasing Its Use.

CELEBRATING the first anniversary of the beginning of an electric vehicle development campaign in Boston, the Boston Electric Vehicle Club held a banquet in the Hotel Thorndike in that city early in the month, at which some 150 were present, including many prominent business men in Boston and vicinity, and electric vehicle manufacturers and dealers. The president of the club, Day Baker, local representative of the General Vehicle Company, Long Island City, N. Y., presided, and E. S. Mansfield of the Boston Edison Electric Illuminating Company was toastmaster.

P. D. Wagoner, president of the General Vehicle Company, spoke in part as follows:

"I think it must be conceded that when hundreds of the largest firms in the country officially adopt the electric for their city delivery service, they must consider it perfected, at least to the extent of being superior to horses and more economical than non-electric trucks for this work. When I tell you that 100 firms already use 1009 electric trucks of one make—that two express companies have purchased no less than 356, two brewers 172, three packers 110, three delivery contractors 93, and three central stations no less than 158, and when you consider further that in the case of the express companies, the brewers and the central stations, many of the electrics now operated by them have been in service from six to 11 years, you must admit that such extensive buying not only voices confidence in the electric, but demonstrates as well that the electric truck gives a larger return on the investment than other types of commercial vehicles.

"This is certainly true of city work, and the bulk of heavy trucking and deliveries is in the city. The fact that in changing from horses to electric trucks, you can utilize your regular horse drivers does much to simplify the operating and economic problem of the man who is adopting motor vehicles. Many of the horse drivers possess a valuable knowledge of the firm's routes and methods of delivery.

"I am not exaggerating when I say that with about 48 hours' instruction by a competent demonstrator, the average teamster can be taught to operate successfully a five-ton electric truck. That is, he will be able to take it around corners without taking the lamp post with him, back into alleys or doorways, go down grades at a safe pace, etc. Furthermore, most drivers are not only willing, but anxious to drive the electrics.

"We do not use electric light because it is cheaper than a tallow dip—it is better. Our competitor uses it—we must keep abreast of the times. Progress is essential and progress demands it. We do not use elevators because they are cheaper than walking. Modern conditions require modern equipment.

"Automobiles for pleasure and commercial purposes are going to be used regardless of economy of operation. Automobiles are in line with the restlessness, the progress and the spirit of the age. The people are bound to have them.

"The motor truck is a money saving proposition, yet the world is going to have it because it is up-to-date, a part of modern business. Electricity provides the solution of most of the transportation problems of our cities and towns. The people like electricity. It is a good, clean product. I bow to that great silent force."

Another speaker was William Kennedy, a consulting engineer retained by the Baker Motor Vehicle Company, Cleveland, O., who said in part:

"It may well be conceded that after 10 years' successful employment in economic service the electric vehicle has ceased to be an experiment and is as well developed as most of the industrial apparatus which we are at present using in commercial life, as absolute necessities to present day conditions. We may be well convinced of this when we consider that the electric vehicle, particularly in its industrial application, is nothing more than a modification of the electric street car, having the same engineering foundation for its design and production.

"With the practical example of nearly 5000 commercial vehicles and over 15,000 pleasure vehicles in successful employment there is today considerable wonder that they are not more universally employed, and the conditions tending to obstruct their almost universal application are well worth studying with the object of eradicating whatever impediment there may be, and giving such impetus to the propagation of their use as to establish in the minds of prospective machine users unquestionable confidence and an inclination to substitute them for the present or existing horse methods with the remarkable reduction in operating expense which would accompany the change.

"A peculiar feature of the increasing business, however, is the fact, generally admitted, that for the past two years nearly 70 per cent. of the commercial vehicles put into service were purchased by firms already using electric trucks, so that the gain in new business secured by manufacturers represents only about 30 per cent. of their total output.

"This indicates two things, which are somewhat difficult to reconcile. One is that this type of machine is so economically successful as to warrant continual increase in the equipment already in use, and the other contrasting feature is that notwithstanding this convincing example to the industrial and mercantile community it does not create a proportionate desire on their part to avail themselves of this economic apparatus.

"It may be interesting locally to know the fact that while there are between 4000 and 5000 commercial machines used elsewhere, Massachusetts is at the present time employing only 170, of which 87 are in Boston proper and 111 in Boston and its immediate vicinity; and the total for New England would probably not exceed 200 electrics, while there appear to be in the same district 1800 gasoline commercial cars. The apathy of the New England district is the more conspicuous in view of the fact that no corresponding territory has had expended upon it anything like the same amount of intelligent and persistent effort to educate the prospective users in the benefits to accrue from the use of these machines, as well as to stimulate effort on the part of those engaged in advancing the propaganda.

"If this situation is to be improved we must broaden our efforts and invite the co-operation of, not only those immediately interested in the sale and use of machines, but every other influence at work in promoting the employment of electric utilities. The more we encourage the public habit of using electric vehicles or electrical service in any form the more we stimulate the general interest with corresponding reflex individual benefit to its various other divisions.

"The present impediment to progress in this direction is a lack of familarity with the real simplicity of the problem. There is an inclination to surround electric vehicle employment with a good deal of unwarranted mystery and to

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lay stress on minor non-essential items which may happen to be questionable at the moment, instead of looking broadly at the conspicuous advantage which machine use possesses.

"Among the greatest difficulties which we encounter in this work is an almost complete absence of knowledge on the part of the users of horse service as to the cost of their transportation except in the few cases where the service is hired or transportation is the principal part of the business, but until the advocates of motor vehicle employment attempted to make the substitution of machines for horses on an economic basis, it is a fact that reliable horse transportation costs were unknown to the average merchant. The necessity of this information is now being recognized by them and they are gradually informing themselves, although the subject is handled in a very crude way by most of them.

"Again, even where we find the prospective user inclined to consider machines favorably we discover a strong disinclination to change the method which has been convenient with the use of horses, to any new scheme of operation which may be necessary to utilize the capacity of the machine. There are also existing obstacles at loading and unloading points, which are the great causes of waste in any system, present or future, which must be eradicated before long as an economic necessity, even independent of the use of motor vehicles.

"We have several splendid advantages in presenting economic facts in relation to the cost of operating electric machines on account of the fairly accurate records which have been kept, particularly in large installations over long period, covering upkeep of the wearing mechanical parts, batteries and tires, and these three essentials are after all the only items that are subject to the slightest doubt in presenting the cost of operation.

"For the purpose of putting some fact forward to substantiate the generally accepted knowledge among us that remarkable economy may be effected by the substitution of machines for horses, the attached table is presented, showing the results of some very complete and exhaustive investigations made with a long period of time devoted to each case and adequate facilities afforded to arrive at an exact knowledge of existing horse cost and to demonstrate beyond question to the prospective purchaser the performance and the cost of operation of the proposed machine equipment. These cases are selected at random from a large collection and represent the transportation departments of prominent and well known commercial institutions in several of the principal cities. The names are omitted purposely as otherwise this information could not be presented.

"Two classes of service are covered in this tabulation. One representing haulage of heavy loads requiring vehicles of two and five tons capacity and the other group representing medium service where the vehicles are largely composed of ton and half-ton machines as well as some larger sizes in minor quantity.

The figures relating to horse equipment are certified to as correct by the respective owners of the installations and the machine equipment has been determined in every case after a complete consideration of the characteristics of the work and extended demonstration with the actual use of machines to prove that the expected accomplishment was practicable. These demonstrated results have been agreed to as convincing and satisfactory by the interested executives in every case, and therefore the entire matter is as nearly fact as it is humanly possible to develop it."

COMPARISON BETWEEN HORSE DRAWN AND ELECTRIC EQUIPMENT.

No. of Horses	No. of Machines	Investment—Horse	Investment—Machine	Expense—Horse	Expense—Machine	Annual Saving	Per Cent. in Earnings on the Investment	Per Cent. Saved Over Horse Expense
Heavy Service—								
75	44	$94,551	$166,733	$136,746	$113,087	$23,660	14.2	17.5
30	11	26,615	36,584	44,198	28,378	15,819	43.2	35.7
16	5	7,975	17,784	15,587	11,557	4,030	22.6	25.8
121	60	$129,141	$221,101	$196,531	$153,022	$43,509	19.6	22.0
Medium Service—								
35	31	$36,485	$83,003	$91,530	$70,663	$20,867	25.0	23.0
17	10	14,300	23,500	29,074	18,972	10,102	42.9	34.0
33	20	21,848	51,126	50,249	38,444	11,805	23.0	23.3
21	14	39,778	46,170	41,593	31,802	9,791	21.2	23.5
48	37	54,095	75,598	115,284	75,745	39,539	52.3	34.2
154	112	$166,506	$279,397	$327,730	$235,626	$92,104	32.9	28.0

MOTOR TRUCK CLUB'S ANNUAL MEETING.

The Motor Truck Club in New York City is doing excellent work in connection with the correction of trade abuses. Many little practises which have stood in the way of complete harmony between buyers and sellers have been brought into disrepute and practically eliminated. This is best exemplified by the fact that one member, a truck salesman, whose methods were held to be detrimental to the development of the commercial vehicle industry, has been expelled, and the principle has been established that the club stands for fair representation in the matter of truck salesmanship.

At the recent annual meeting, held in the rooms of the Automobile Club of America, the following officers were elected: President, D. C. Fenner, manager of the Metropolitan branch of the International Motors Company; vice president, Emerson Brooks, vice president of the Remington Standard Motor Company; secretary and treasurer, Charles E. Stone, Hexter Motor Company; managerial board, F. B. Porter, Chase Motor Company; E. Lascaris, De Dion-Bouton; E. O. Hoopengarner, Swinehart Tire Company; A. N. Bingham, Hewitt; E. W. Curtis, Jr., General Vehicle Company; A. J. Slade, consulting engineer; John Hanson Kennard, Couple-Gear.

MAY HAVE AUTOMOBILE LINE.

While until recently very little effort was made to develop the sale of commercial vehicles in the Rocky Mountain district, the people of that section appear to be quick to realize the benefits to be obtained through the use of mechanical transports. The latest information indicates that a practical demonstration of the motor 'bus for cross country transportation is to be granted by H. M. Lamson of Mesa, Ariz., who has organized an automobile line to be operated between that city and Phoenix.

Cars are to be run on a fixed schedule, arriving and departing every two hours, from 7 in the morning until 11 at night. The fare will be five cents a mile, single mileage, although coupon tickets will be issued good for 500 miles at three cents a mile. Stops will be made at any point on the line, the same as with trolley cars, and it is expected that the farmers throughout the district will furnish a decidedly important share in the success of the venture.

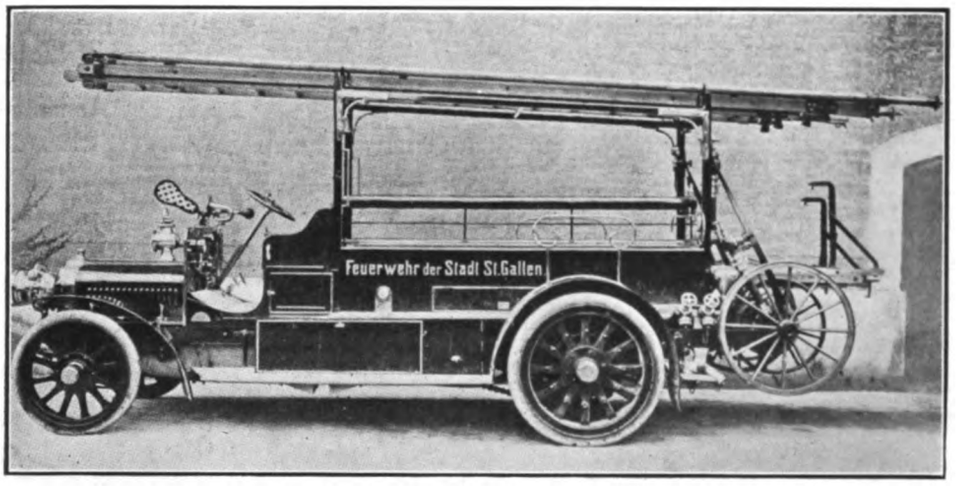
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FIRE DEPARTMENT NOTES

It was announced recently by the International Motor Company, New York City, maker of Saurer, Mack and Hewitt commercial vehicles, that Saurer fire apparatus would be manufactured at its Plainfield, N. J., plant. In the accompanying illustration is presented one of the types to be made, this machine being in service at St. Gallen, Switzerland, the original home of the Saurer automobile.

The vehicle is a complete piece of apparatus and is propelled by a 60 horsepower motor. In a test at Bound Brook, N. J., a similar machine delivered a stream of water of greater volume through six lengths of 2.5-inch hose than steamers of that section could produce. Another test consisted of coupling four separate hose to the connections of the pumping device and it was shown that the streams were of good size. When connected to a city hydrant, where the water pressure was about 65 pounds, the pump drew this down to less than 30 and raised the pressure at discharge to 136 pounds.

The pump is of the centrifugal type and is said to be capable of delivering 550 gallons of water a minute at a pressure of 150 pounds. Two suction connections are provided for the purpose of taking water either from a hydrant or a stream. The pump is located at the rear of the chassis and is controlled by a hand lever.



Saurer Combination Hose, Hook and Ladder and Pumping Engine in Service at St. Gallen, Switzerland, Duplicates of Which Are to Be Manufactured in This Country by the International Motor Company, New York City.

Fire Commissioner Joseph Johnson of New York City, through whose efforts the horse drawn equipment is being replaced as rapidly as convenient, and who is perfecting a thoroughly efficient motor fire department, has adopted plans whereby a competent staff of automobile mechanics and drivers will be in constant readiness to perform the duties necessary to keep the equipment in active operation.

The commissioner's plans are entirely his own and were adopted after consultations with manufacturers and technical experts. The change involves the disappearance of the old drivers and engineers and to some extent the entire personnel of the department. To bring these conditions about and not to impair the efficiency of the department, a school of automobile engineering was established.

To motorize a horse fire department requires time, labor and experience, and with the material to work on, unfamiliar with motor propelled vehicles, the task has been unusually difficult. It is interesting to note, however, that of the 127 men who have been members of the school no less than 120, or 95 per cent., have graduated. Each of the 120 is not only capable of operating an automobile, but can assemble a motor and perform such duties as are required of an ordinary automobile mechanic.

The school was started last September and no special qualifications on the part of the applicants were required. After being elected, the men are formed into classes of 25, and for the first 10 days the members are instructed in the simple rudiments of motor construction. If during this time, any member shows himself to be deficient, or, in other words, fails to grasp the details, he is sent back to his company.

The term consists of 30 working days of six hours each. During this time each student is required to become familiar with minor difficulties which might be encountered upon the road. After being admitted to the class, each member is presented with a list of 30 questions which are explained in detail by the instructor. These questions cover the final examination, and must be answered in a satisfactory manner to secure a certificate of graduation. In addition there are 300 questions covering the working of the motor, these being sub-divided and relating to operation and troubles of the components of the machine.

Applicants are received between the ages of 22 and 40, although exceptions have been made in some instances. The men report to their respective stations after 6 in the evening for regular duty. When the member is presented his certificate he is warned that his work will be watched constantly, and should anything occur to warrant it the certificate will be cancelled. This is done to maintain the proper efficiency of the department.

A feature of the school is the regulation of speed on the city streets. The limit is 15 miles an hour, but many of the students desire to drive at a rate of 25 miles, and in order to guard against this Commissioner Johnson had the cars fitted with governors which confine the speed to the lower figure.

During the next year 42 companies will be organized, and to complete the equipment for these, 200 more men must be educated. In speaking of the methods utilized the instructor, Capt. J. J. Henry, says the men are educated on engine construction, transmission, clutch and differential, cooling methods and lubrication. Ten days are allowed for preliminary work and at the end of that time, if proficient, the student is instructed in the control brakes and clutch levers and the use of fuel and lubricants.

Passing these tests the members are assigned to the duty of disassembling a motor and transmission. Ignition and carburetion is then taken up and lectures given upon these subjects. At the end of 20 days the class is given instruction in road work and exhaustive tests must be

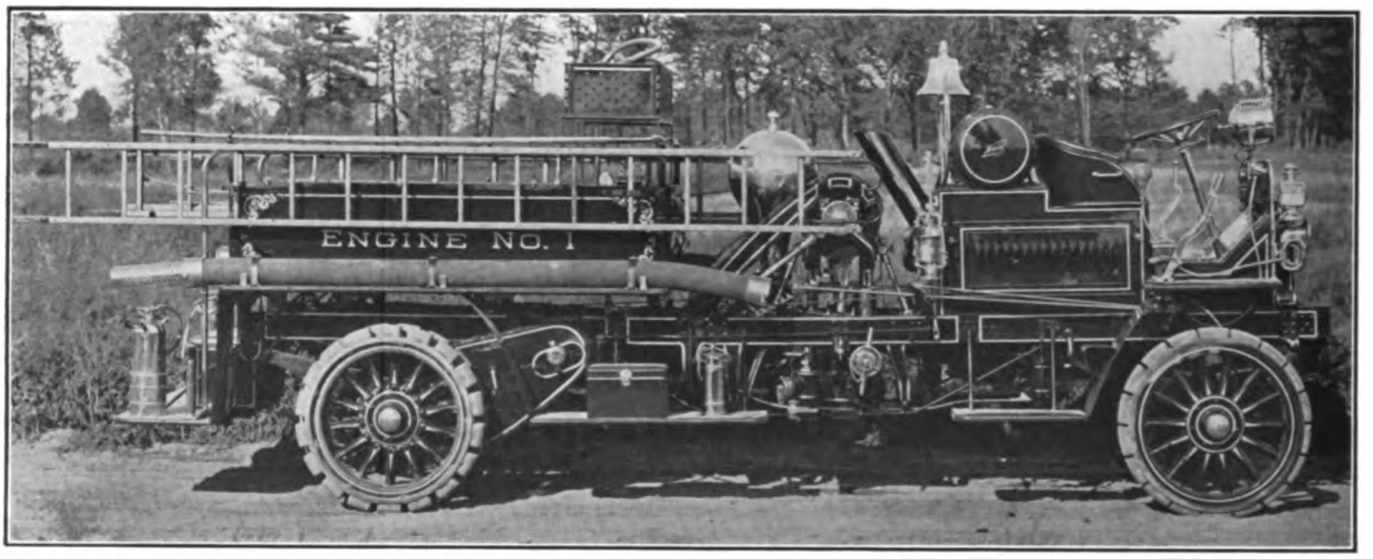
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complied with, such as operating in crowded traffic and at different speeds.

The motor equipment at present consists of 10 hose wagons, one front-drive propelled steam engine, one Couple-Gear water tower and four hook and ladder wagons of similar design. Commissioner Johnson advertised recently for bids to supply the department with 26 combination chemical and hose wagons of the flying squadron type, three wagons of the high pressure type and three machines without chemical attachment. The total cost will be in the neighborhood of $700,000.

As a result of visits to the commercial car shows at New York City and Boston, Portsmouth, N. H., is to have a Pope-Hartford chemical wagon, made by the Pope Manufacturing Company, Hartford, Conn. The mayor of Portsmouth and chief engineer placed the order at the Boston show and delivery will be made June 15. The machine will cost $5000 and will be fully equipped.

Many towns and small cities make it a practise to establish a central station in which is installed apparatus capable of affording protection to the entire community. While the equipment is limited it must be of high efficiency and capable of covering considerable ground rapidly. Many of these municipalities cannot afford to purchase several pieces of automobile apparatus and to meet these requirements the Knox Automobile Company, Springfield, Mass., is producing a vehicle which in itself is a complete department, combining as it does the hose cart, hook and ladder truck, chemical and pumping engines.



New Knox Combination Apparatus, Made by the Knox Automobile Company, Springfield, Mass., Which Is a Fire Department in Itself, Exhibited at the Boston Show Recently.

In the accompanying illustration is presented the machine which was shown at the Boston show recently where it attracted considerable favorable attention among visiting officials of towns and cities contemplating the purchase of the motor propelled apparatus. The car is propelled by a powerful six-cylinder motor which operates a pump capable of pumping several hundred gallons of water a minute. The machine is equipped with a chemical tank, the hose for which is carried in a cage, making for accessibility. Hand chemical tanks are fitted, also a number of ladders; in fact, all modern fire fighting devices are included.

The body provides ample seating capacity and throughout the material is the best and the workmanship of the highest quality. Solid tires are fitted, single in front, and dual in rear, and drive is by chain, fully enclosed. The construction of the chassis is in keeping with the high grade established by the Knox Automobile Company and the design should find favor with municipalities contemplating the installation of automobile fire apparatus.

Ipswich, Mass., depends upon a volunteer fire department for protection, and the members of this company are to be commended for their progressiveness. For several years the company has desired an automobile, but the town fathers could not see their way clear to appropriate the money. The company was undaunted, however, and began a series of entertainments for the purpose of raising money enough to purchase a piece of motor propelled apparatus. The townspeople warmly supported the efforts of the firemen and after raising a little more than half of the sum required, enlisted the aid of the town officials who contributed the difference. An order was placed with L. B. Butler of the Butler Motor Truck Company of Boston, now with the General Motors Truck Company, Detroit. The machine, which was delivered recently, is a combination hose and chemical wagon, having a 25-gallon tank and 500 feet of hose. In addition it carries ladders and the usual equipment. It is lighted by electricity. A feature of the truck is the fitting of the original Bonney-Cot bell, taken from a hand cart in Boston, which was cast in 1852, taken to Ipswich and kept as a relic by one of the residents who presented it to the fire company.

The fire department officials of Boston were given an opportunity to note the practicability of the motor propelled vehicle recently when a ladder truck was driven from Longwood and Brookline avenues, Roxbury, to the top of Parker Hill in less than three minutes. The machine was a product of the American-La France Fire Engine Company of Elmira, N. Y., and was handled by a representative of that concern who was unfamiliar with the route. The truck will be in service at Forest Hills for one month during which time it will answer alarms and its work will be watched by the department officials. If it proves satisfactory, steps will be taken to secure its purchase. The machine carries a complete equipment of ladders, two 40-gallon chemical tanks and 200 feet of hose, in addition to the usual fire fighting apparatus. It is propelled by a four-cylinder, four-cycle water-cooled motor and is equipped with a hydraulic transmission affording any number of speeds.

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SOLVING CONTRACTOR'S DUMPING PROBLEMS.

Lynch Special Bodies Provide Means for Handling All Classes of Material in Simple and Effective Manner with Substantial Saving in Time and Labor.

BECAUSE of the superiority of the mechanical transport over horse drawn equipment in the matter of quick haulage, as well as in economy of operation, it makes a decided appeal to building and excavating contractors, as time is money in every sense of the word in these lines. But, as with numerous other industries, some means must be devised for rapid handling of materials if the motor truck is to give its maximum of efficiency.

In order to consider this matter more fully, let it be assumed that contract calls for creating a substantial railroad bed across a large swamp. Under these circumstances, it usually will be necessary to secure the material at some little distance from the swamp. To be sure, the railroad might be utilized in conveying loaded cars from the excavating point to the place of dumping, but those who are most familiar with operations of this nature, will agree that the contractor is forced to secure his material wherever possible, and teams are much more frequently called upon to do the hauling.

The motor truck offers an ideal solution of the difficulty, but there are other considerations than the mere hauling of the material. For instance, it manifestly would be impossible to run any loaded wagon, no matter what the type, over the swamp itself. Material might be drawn to the extreme limit of the graded portion of the right of way and dumped, but this would mean a large force of men at this end of the work, as well as at the scene of excavation.

Realizing the importance of time in this respect, Charles Lynch of the Lynch, Brandenberger Company, Chicago, Ill., a firm engaged in excavating and general teaming with sand, gravel, etc., recently devised a portable dumping body or box, which this concern has utilized with splendid success. This body is now made in a wide variety of types for all classes of work, and marketed by the Lynch Manufacturing Company, South Chicago, Ill.

Accompanying illustrations present the Lynch body in three different designs, although the photographs are of models instead of full sized truck bodies. The standard box is made to fit any five-ton truck chassis, being 4.5 feet wide, 12 feet long and any height desired. The chassis itself is fitted with a standard platform body, supplemented by a frame of eight-inch channel iron, which holds the dumping body securely in place. Fig. 3 illustrates this construction somewhat more clearly. Returning to the matter of filling in the swamp above mentioned: By using one derrick at the excavation point and another at the swamp, the equipment is completed with a standard five-ton truck and several of the Lynch bodies. The latter are lowered into the excavating hole, where they are filled either by hand or steam shovel, then lifted by derrick onto the truck chassis. Arriving at the dumping place, the other derrick is called upon to hoist the loaded box from the chassis, swing it over the swamp and dump it wherever desired. The truck is delayed at either end of the route, only long enough for the derrick to lift the empty box off the chassis and replace it with a filled box, or to take the loaded box, dump and return it to the chassis, a matter of less than five minutes.

The three types of bodies illustrated at Figs. 1 and 2 permit at least three different methods of dumping. For the swamp job, possibly that at C would prove most effective. This dumps through the bottom. The two halves are

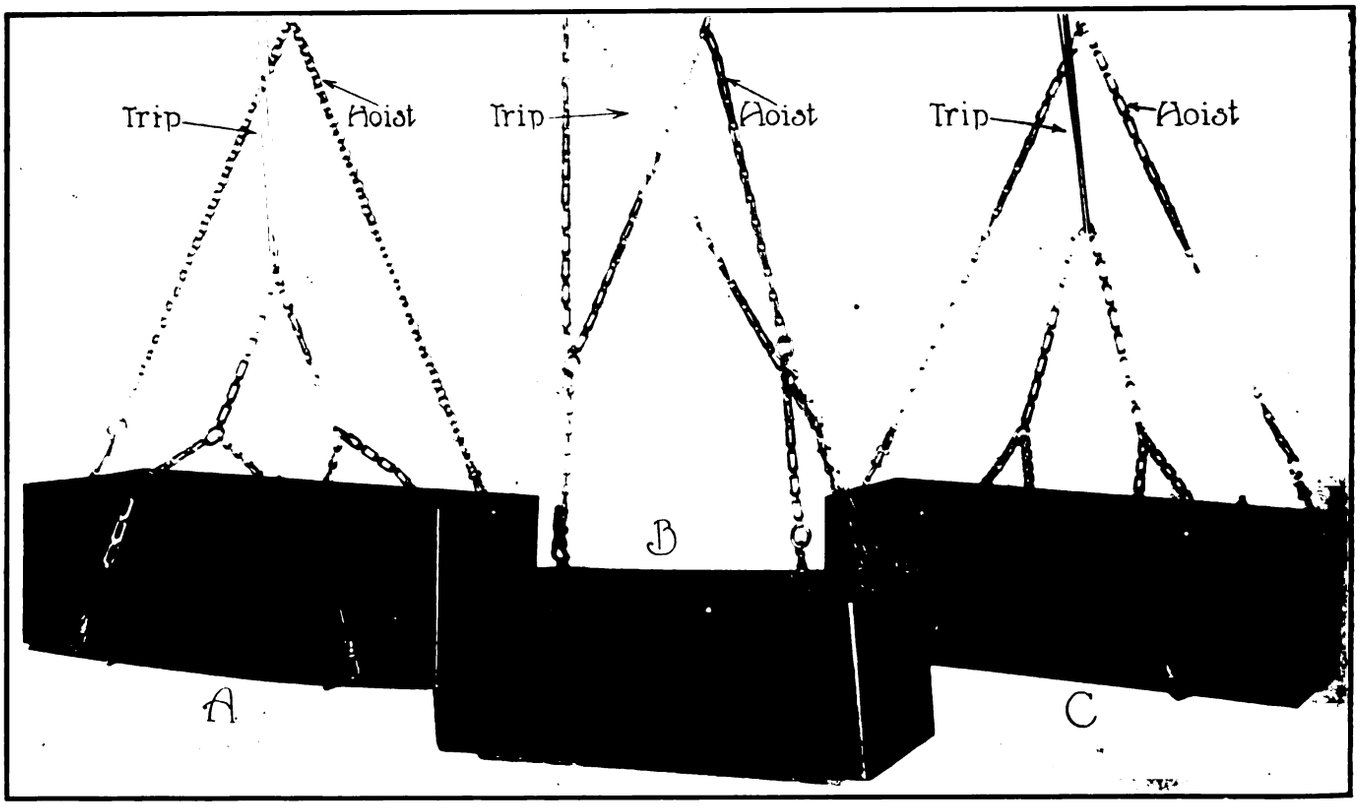


Fig. 1—Three Types of Lynch Bodies as They Would Appear Lifted Clear of Their Chassis, Preparatory to Dumping.

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pivotally mounted at either end, so as to swing outward when the trip is sprung. It will be noted that the hoisting chains extend from the top of either end, and as the derrick picks up the loaded box, the weight of the material within acts to hold the two sides firmly together.

When it is desired to dump the entire contents at one time, the chains operating the trip are fastened at suitable points at the bottom of each side. As the loaded box is swung into position, a pull upward on these chains, which are brought together over the top for this purpose, causes the sides to spring outward and every bit of material within is dumped instantly.

This same type of box may be utilized for hauling brick, in which case it is not only possible to dump the entire load at a given point, but one-half of the load may be dumped in one place and the remainder in another. In this instance, the trip chains on the side in which it is desired to retain the load are unfastened from the clips at the bottom of that side and hooked in similar slips at the top. Pulling the trip then pulls the opposite side upward, to pull the rear end of the box upward as the load travels toward the opening in front.

It readily will be seen that any of these bodies could be utilized with success in excavating and dumping work, while each has a special appeal in other lines of activity. With each, the entire operation of the dumping feature is in the control of the engineer in charge of the derrick, and he has full control of the working parts at all times.

Boxes A and B also are adaptable for dumping by the motive power of the truck. In order to make such use of them, however, it is necessary to utilize a special construction, in which four jack screws play a prominent part. These jacks are placed, one each at the four corners of the frame, and are fastened to the chassis. Suitable clutches are installed to connect the jacks with the truck engine.

With box B, for instance, the operator throws in the clutches for the two front jacks and the front of the body is forced upward until the load travels out the rear, the end gate, if such it may be termed, having been raised meantime. With box A, the load may be dumped from either

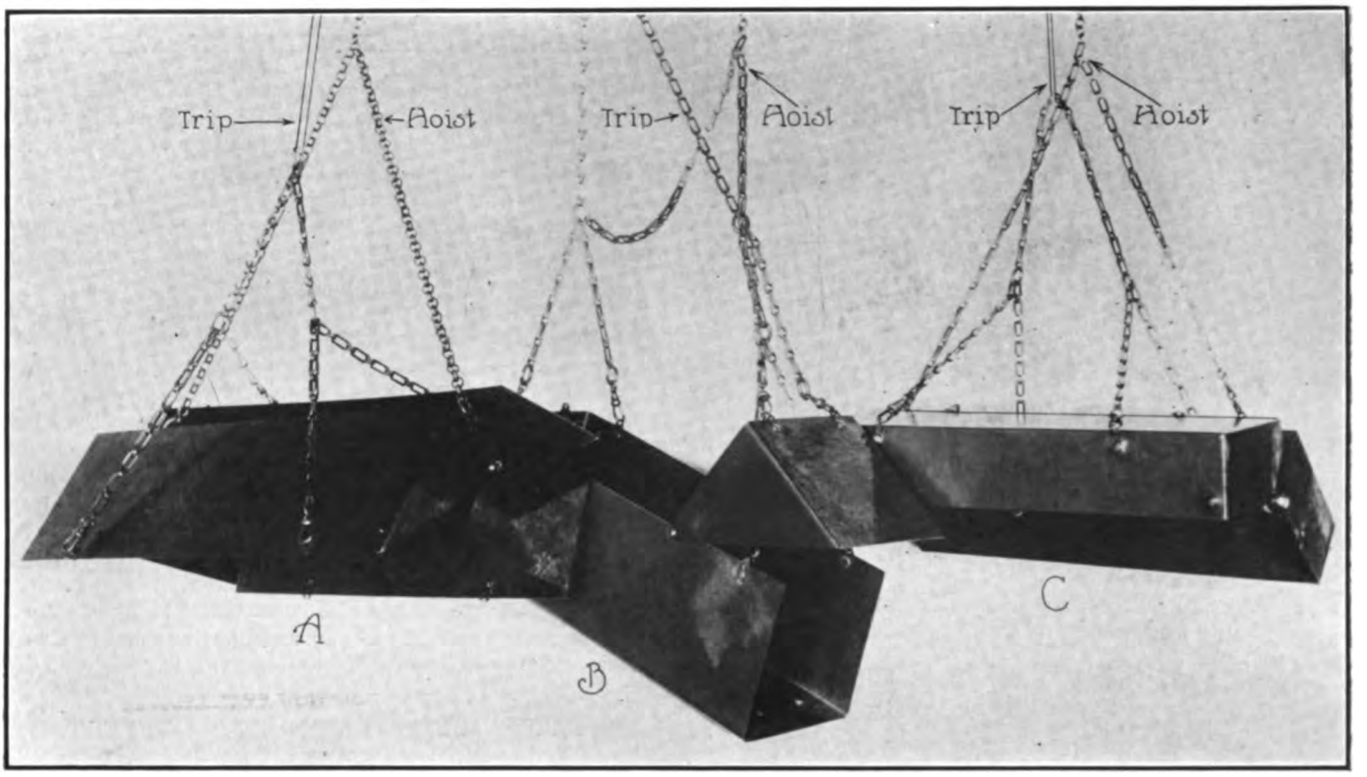


Fig. 2—The Three Types of Lynch Bodies in Dumping Position: A, Load Emptied from the Side; B, End Dumper; C, Load Released Through Bottom.

while the bricks it is desired to retain are left in the box to be dumped later by a reversal in the manner of hooking the chains.

The box at A also might be used on the swamp job, but this is designed to be dumped at the side instead of at the bottom, and it may be dumped at either side. The construction is very similar to that shown at C, with the exception that the bottom and ends are solidly retained in position while the sides swing outward, according to which side it is desired to operate in dumping.

The third box is an end dumper. One end is pivotally mounted at a certain distance on the sides, and the hoisting chains are fastened at the top at four points equi-distant from the centre. The trip is attached to the top of the end at which it is desired to dump the load, while the other is connected with the hoisting chains at the rear. When swung into position for dumping, the trip is operated in the same manner as the others, but the hoisting chain tends side in a similar manner, by utilizing the clutches for the jacks on the opposite side.

Inasmuch as all bodies are made in the same standard size, they are absolutely interchangeable. Thus it is possible to utilize the type best adapted for hauling brick today, and change to stone or asphalt tomorrow, and dirt the next day. In fact, there appears to be no limit to the possibilities afforded by the possession of a set of these boxes, although, as it is has been pointed out, it is not absolutely necessary to have different bodies in order to handle varying loads with success.

While numerous types of dumping bodies have been designed for the hauling of coal by mechanical transport, it is pointed out that the Lynch body has a special advantage in that the truck might be employed profitably in other work when not needed for the delivery of the main product. In addition, the interchangeability of the bodies is expected to have an appeal for those who desire to solve the prob-

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lem of loading the truck without delay at the receiving end of the line.

Although it was such work as that of excavating and dumping, which originally developed the device, it has found ready acceptance in numerous other fields. It is unnecessary to cite a list of its many possibilities, but it will prove of interest to note how effectively it might be used in building construction, particularly with the so-called sky scrapers of the larger cities. A material saving in time and labor might be brought about by hoisting a loaded body of this type to any floor of the partially completed structure, and there dumping its load of brick, etc., without extra handling.

The Lynch Manufacturing Company has studied this system from every angle and is prepared to go over the situation with any truck owner or manufacturer who feels as it does, that the Lynch portable dumping body offers a satisfactory solution to many of the problems of motor transportation. The scheme is by no means confined to trucks of five tons capacity, and it would be possible to secure bodies equally adaptable to smaller vehicles.

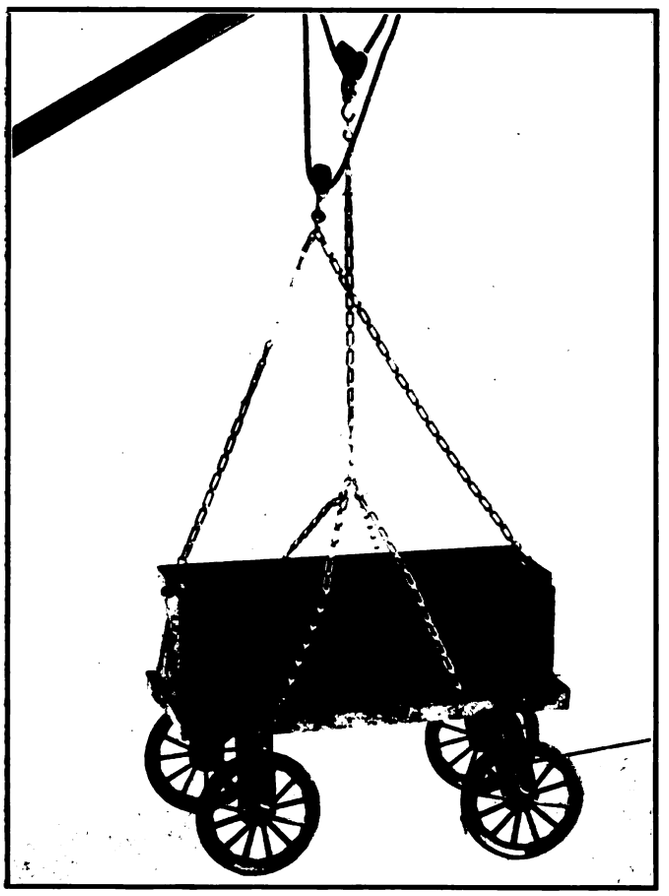


Fig. 3—Lynch Portable Dumping Body in Place on Truck Chassis, Ready to Be Lifted by Derrick.

OPERATING COSTS OF ENGLISH TRUCKS.

During the recent visit of the American automobile engineers to Europe the party discussed commercial vehicles with a prominent British truck expert, who has made a study of trucking costs as they exist in England. The authority had gathered statistics from a number of installations, and after comparing them arrived at a very fair estimate of the average cost of service in that country and gave the figures to one of the members of the party.

In comparing these costs with those in this country allowance should be made for the differences in environment, notably that of wages, as those paid to English drivers are about one-half of what they are in this country. The figures presented in the accompanying table will prove of interest:

	——Vans——		——Lorries——		
	1120	2240	2	3	5
Size of Vehicle—	lbs.	lbs.	tons.	tons.	tons.
First cost	$1536	$1752	$1936	$2856	$3336
Weekly mileage	400	400	390	350	300
	—— Operating costs a mile ——				
	Cents	Cents	Cents	Cents	Cents
Driver's wages	1.68	1.68	2.00	2.18	3.20
Fuel (petroleum spirit)	1.10	1.54	1.90	2.50	3.34
Oils and grease	.24	.24	.28	.32	.48
Rubber tires	1.00	1.50	2.30	3.00	5.20
Repairs (materials and wages)	1.10	1.70	2.06	2.34	3.00
Rent, rates and lighting	.24	.30	.50	.80	1.00
Insurance and claims	.24	.48	.70	.84	1.30
Depreciation	1.026	1.168	1.424	1.90	2.22
Interest on capital	.368	.42	.524	.78	1.00
Vehicle mileage totals	6.994	9.028	11.688	14.66	20.74

Yearly Totals.

Vans—		Lorries—	
1120 lbs	$1449.60	2 tons	$2366.40
2240 lbs	1876.80	3 tons	2664.00
		5 tons	3264.00

CARE OF TIRES MEANS MILEAGE.

Overloading and overspeeding are conceded to be the greatest evils of the commercial vehicle as not only is the mechanism of the machine subject to stresses, but the life of the tires is shortened. D. C. Swander, manager of the New York branch of the Firestone Tire & Rubber Company, Akron, O., says there are a few simple rules which the owner of every truck will do well to instill in the minds of his drivers.

"Rubber has just so much life and no more, and if overworked cannot recuperate," explains Mr. Swander. "When the machine is overloaded or overspeeded the rubber suffers. Another thing that shortens the life of a tire is brakes that are out of true. If one be tighter than the other, one tire is subject to all the strain. Wheels should be trued up, and oil or grease should not be allowed to accumulate on the rubber. Drivers should be careful to start and stop gradually, not suddenly, and always in a straight line. By turning the front wheels before starting an unnecessary strain is placed upon the tires and their fastenings. Car tracks are also detrimental to tires. They grind away their edges. If these suggestions are followed the tire expense will be reduced considerably."

WHITE 'BUSES GIVEN SEVERE TEST.

The efficiency of motor propelled passenger omnibuses was demonstrated in Chicago during a severe blizzard in that city recently. The 55-mile gale accompanied by a heavy fall of snow tied up the street car and elevated lines and even the Illinois Central suburban service was inoperative. In spite of the conditions the fleet of 12 White 'buses, manufactured by the White Company, Cleveland, O., were constantly in service between the Northwestern depot, Marshall Field's and Mandel's. The machines ran on scheduled time during the entire storm.

PROPOSE THREE-DAY RUN.

A three-day truck run is being agitated by the dealers in Boston. It is proposed to make the event more of a demonstration of the practicability of the mechanical transport by having the machines go by easy stages from Boston to Providence and thence to Worcester and back to the starting point. A stay in each city is contemplated for the purpose of affording the business men an opportunity to inspect the vehicles.

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CORRESPONDENCE ON PERTINENT SUBJECTS.

Mr. Thomas Takes Occasion to Explain His Position More Fully with Respect to Anti-Friction Bearings for Worm Gear Mounting.

CONCERNING the subject of anti-friction bearings for worm gear mounting, a discussion of which has been going on in these columns for some issues, H. Kerr Thomas of the Pierce-Arrow Motor Car Company, Buffalo, N. Y., took occasion to criticise some of the statements made by Victor W. Page of the New Departure Manufacturing Company, Bristol, Conn. In the March number Mr. Page answered Mr. Thomas at some length. In the following communication Mr. Thomas explains his position more fully:

Editor, MOTOR TRUCK,

Sir:

I have been interested in reading Victor W. Page's last letter given in your March issue, and would like to point out that having no experience on the matter, I have never questioned the suitability of New Departure bearings for use in worm gearing. My object in entering the discussion at all was to caution Mr. Page and others of your readers against the light loads explicitly specified as existing in worm gears in Mr. Page's first article. Engineering generalizations are invariably dangerous. Calculations applicable to one automobile would not necessarily be used for another.

The reason why the particular truck in which I am interested has such high loads on its bearings is owing to the fact that the entire load is practically confined to the rear axle for sufficiently good reasons. It would have been easy to distribute it had I thought this advisable.

Mr. Page, however, raises in the course of his last letter, such numbers of points that the entire design of an automobile is involved, such as required horsepower, worm efficiency for different angles, worm tooth pressures, vehicle speeds, transmission efficiency, traction efforts, motor torque, and other matters. I will only refer to two of these.

Mr. Page, in the example he gives, states that the torque at the centre of the worm shaft is 2961 inch-pounds. As I understand "torque," there can be no such thing as torque at a centre. If the torque is measured at the centre, the "inch" factor has been reduced to limit 0, hence the "pounds" factor must be raised to the limit of infinity, and I do not think Mr. Page means this.

Next, Mr. Page refers to the worm efficiency of 88 per cent. and questions Mr. Younger's claim for 95 per cent. The loss in driving through worm gears is not greater but very much less than five per cent., as a manufacturer of worm gears of the highest repute in this country can demonstrate to Mr. Page if he wishes.

I will not, however, labor this point as I have dealt with it fully in the pages of one of your contemporaries, and while I regret I must still differ with Mr. Page in many of his deductions, I must thank him for his appreciation of the friendly spirit of my criticisms. They were never offered in any other.

Yours truly,

H. KERR THOMAS, A. M. I. Mech. E., M. S. A. E.

Buffalo, N. Y., March 19.

MUNICIPALITIES IMPROVING TRAFFIC CONDITIONS.

THERE is little question that traffic conditions have a very material bearing on the successful introduction and use of the commercial vehicle, and it is interesting to note that several municipalities, realizing the importance of the newer method of transportation, have taken up the matter in a systematic manner. A. W. Robinson of the Locomobile Company of America, Bridgeport, Conn., has given this subject considerable study and the result of his findings are embodied in the following communication:

Editor, MOTOR TRUCK,

Sir:

Traffic conditions in congested portions of our large cities have been so greatly improved by the motor truck that it is not a wonder that so much co-operation has been obtained from the municipal authorities and from the heads of the various railroad and shipping companies. Today the owner of the motor truck finds conditions vastly improved over those of three years ago, but there is still room for improvements and for added facilities whereby the efficiency of the motor truck can be so increased as to result in a still further saving for the owner, for the municipality, and for the transportation companies.

The efficiency of a motor truck varies directly with the percentage of time during which it is transporting producing loads. Consequently, every minute lost, either through delays due to the congestion of traffic, through waits to get up to or away from a loading platform, or through the necessity of making detours to avoid streets which have been closed by the municipal authorities, all go to cut down the efficiency of the truck by preventing it from making the number of ton-miles, which under normal circumstances it should.

From the owner's viewpoint it is not reasonable to expect him to incur a large expense and make a heavy investment for motor trucks, each of which would supplant three two-horse teams, if such an investment is not a paying one. Various municipal and transportation officials realizing the immense advantage of the motor truck, and knowing that the motor truck is saving them large amounts of money through its relieving congestion, are co-operating with the owner to eliminate many of the delays which in the past proved so alarming.

Municipal authorities find that motor traffic has, from their viewpoint, three great advantages over horse traffic. They find that the motor truck is less destructive on the street, reducing the maintenance charges of the street repair department; they know that the reduction of the amount of horse debris, due to the supplanting of the horse by the motor truck, not only effects a large financial saving but it also has resulted in a betterment of the public health, due to the more sanitary condition of the streets. They also appreciate the fact that the motor truck has decreased, for any given tonnage, the number of vehicles required, with a consequent relieving of traffic congestion at rush hours.

This last is a very important factor in municipal conditions today and can be better realized when it is known that the normal large capacity truck, which under ordinary circumstances will supplant three two-horse teams, not only occupies a space equivalent to about 30 per cent. of the actual length of three such teams and wagons but also, owing to its great flexibility and ease of control, it can follow closer to the vehicle immediately preceding it. As an actual fact, assuming that the traffic conditions in any given street are as congested as they are today, something over four times as much tonnage could be carried by a given point in a given time if all the traffic were carried on motor vehicles. Or assuming that only the same tonnage was to be transported, traffic conditions would be greatly relieved and congestion would be practically eliminated.

Municipal authorities are doing all they can to further this end by keeping the streets in better repair, and by giving the faster moving motor vehicles the preference wherever possible. It is probable that in the near future, the municipalities will co-operate further by opening many streets which are now closed to heavy traffic, and thus enable the truck to save time by eliminating detours which formerly were necessary.

Immense improvements have also taken place in the last few years at the railroad depots and at the wharves. Where formerly the motor trucks were compelled to take their place in line and gradually work up to the platforms, today many progressive officials, intent on serving the best interests of their own stockholders, have minimized traffic delays by providing special platforms for motor trucks only. Railroad officials, trained and educated in the handling of freight, traffic experts in the broadest sense of the word, realize better than anyone else the need of speed, and they welcome any innovation which tends to relieve any congestion on their own platform, and which diminishes the time in transporting goods from the factory to the shelves of the distributor. While the idea of reserving a platform for motor trucks only is a comparatively new innovation, railroad after railroad is adopting the idea as fast as conditions and expediency will permit, and the percentage of space so reserved is increasing far more rapidly than any one not thoroughly conversant with the situations would imagine.

The same conditions obtain at the wharves; steamship traffic men, owing to the greater intervals elapsing between their shipment, are far more troubled by freight congestion than are the railroad traffic men, and they appreciate the relief from congestion afforded by the motor trucks. The motor truck has been valuable to steamship men in another way. If a wharf can be quickly cleared and a new cargo as quickly put on the wharf, sailings can be more frequent without increased wharfage facilities, a very serious problem when the comparatively small number of good wharves and of really good ports is considered. Steamship men in their endeavor to take advantage of benefits accruing from the motor truck have done a great deal for the owner.

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Only a few years ago, before the steamship men took an active interest in motor trucks, foolish fire regulations, since repealed, made it impossible to run a motor truck on a wharf in any of the large cities in this country, and it is only recently that wharves have been sufficiently well constructed as to stand up under a moving concentrated load as heavy as a large capacity motor vehicle.

The extent to which co-operation has been carried out might be continued indefinitely, but let it be sufficient to say that today every effort is being made to increase the scope and the field of the motor truck, not only by the manufacturer and by the user of these vehicles, but by all parties directly or indirectly interested in the great problem of transportation. Every improvement in traffic, depot or wharf conditions not only effects a saving for the truck user, the railroad man, or the shipping man, but also is of vital importance to the public at large. The public's interest lies in the fact that minimizing of delay means a lower transportation cost. Every cent saved in transportation between the producer and the user eventually results in a lower price for the user. While in the individual case this saving is not large, in the aggregate, an immense amount of money will be saved when traffic conditions are such that the majority of goods distributed in the various cities and towns, are transported on motor trucks.

Yours very truly,

A. W. ROBINSON,

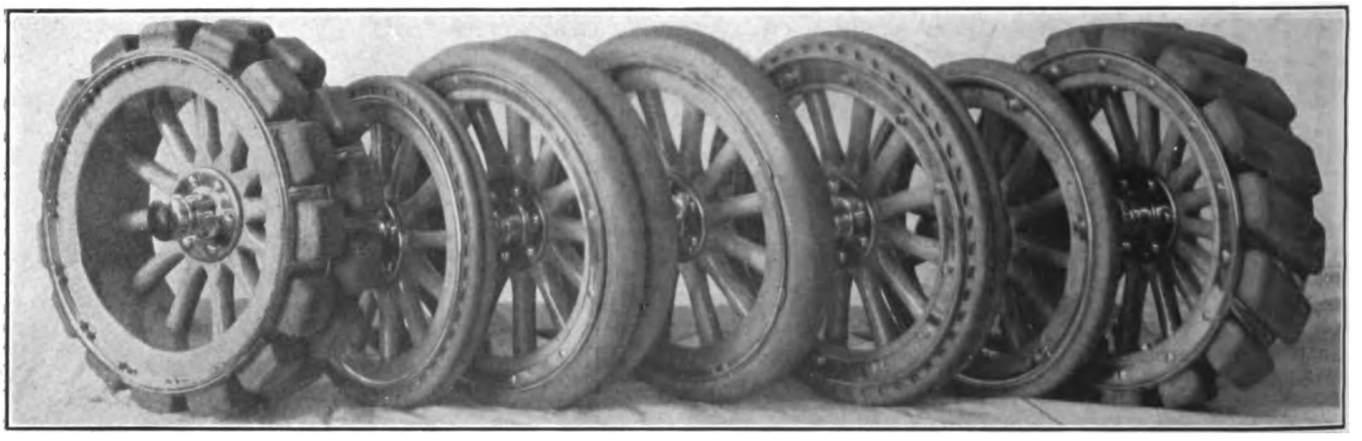
Truck Sales Manager, Locomobile Company of America.
Bridgeport, Conn., March 13.

GOODYEAR TIRE LINE FOR 1912.

Tire manufacturers are keenly alive to the certainty of tremendous growth in the motor truck industry which is expected to equal that of the pleasure vehicle within the next few years. The Goodyear Tire & Rubber Company, Akron, O., has made preparations for its share of the business and has adopted for its slogan, "A Tire for Every Service." In the accompanying illustration is shown the Goodyear line for 1912 and these are, reading from the left to the right, the individual block, Goodyear-Motz cushion, Goodyear demountable, Goodyear metal base, Goodyear-Motz fire department and diagonal block tire.

Regarding the individual type, great stress is laid on the fact that one of the blocks may be removed and replaced without disturbing the other members. Each block has its own fastening plate and this device is extremely simple.

The demountable truck tire is furnished in the single as well as dual type and the Goodyear company emphasizes the claim that this style will be universally used shortly. The Goodyear demountable is recommended by its maker as simple of operation, guaranteed for 10,000 miles and adaptable to the S. A. E. standard wheel. The metal base tire is of the permanently attached type and finds favor with many truck owners.



Goodyear Truck Tires for 1912: Reading from Left to Right, Individual Block, Goodyear-Motz Cushion, Goodyear Demountable, Goodyear Metal Base, Goodyear-Motz Fire Department, Diagonal Block.

CONDITIONS GOVERNING TRUCK USE.

That the last two or three years have seen a marked change in the manner in which business men approach the purchase of trucks, is the opinion of C. P. Cary of the Peerless Motor Car Company, Cleveland, O., who has given much thought and study to this phase of the selling situation. He finds that the early vehicles were bought largely because the purchasers thought it would give them a reputation for progressiveness and would prove a good advertising expenditure. He says.

"Naturally, they knew nothing about trucks. A truck was a truck and they usually took the one that was represented by the most engaging salesmen. Those who happened to select a proper capacity vehicle found in most cases, that instead of being more expensive than horse delivery, as they rather expected, motor haulage really saved them a great deal of money, providing good men, who knew how to operate the vehicles and care for them properly, were secured. Those who purchased trucks not suited to the service, or who permitted them to be operated by poorly trained drivers, returned to the horse, or after much expensive pioneering found a suitable truck that would do their work economically.

"While the advertising value of commercial power vehicles has not entirely disappeared, it is a factor that is not longer regarded as greatly important by truck buyers. The truck when well made and given enough work to pay its way, performs an extremely valuable service. And as service over a considerable period of years depends upon construction, most buyers go rather carefully into the mechanical features of every vehicle that comes under their consideration."

J. M. WARD SUCCEEDS P. P. WILLIS.

J. M. Ward of the Waverley Company, Indianapolis, Ind., has been appointed to succeed P. P. Willis as secretary of the Indiana Automobile Manufacturers' Association. The appointment was announced recently by Frank E. Smith, general manager of the Maxwell-Briscoe plant at Newcastle, Ind. Mr. Willis resigned previous to the New York show and President Smith reserved naming a new official until recently. Mr. Ward is well known to the automobile industry.

MOTOR CAR EXPENDITURES.

According to a report filed by the police board of Hartford, Conn., the automobile expenditures from April 1, 1911, to Feb. 29, 1912, were as follows: Two patrols, $1355.39; ambulance, $528,66.

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The Enterprise Trucking Company, New Haven, Conn., has been incorporated for $10,000.

The National Motor Transportation Company, Washington, D. C., has been incorporated for $1,000,000 to do a general transfer and passenger business.

J. K. McKeough, well known in the automobile industry, has accepted a position with the Chicago branch of the Velie Motor Vehicle Company of Moline, Ill.

The Stewart & Clark Manufacturing Company, Chicago, maker of Stewart speedometers, has leased a store and basement at 174 Columbus avenue, Boston.

The Motor Truck & Auto Company, Portland, Me., has been incorporated for $10,000. Lewis A. Goudy is named as president and George W. Merrow as treasurer.

Bishop & Whitney, operating a garage at Canaseraga, N. Y., has taken over the garage and taxicab business of Roberts & Son, Baldwin street, Elmira, N. Y.

James A. Williams, Boston, New England agent for the Cartercar Company, Pontiac, Mich., has leased the store and basement at 998-1000 Boylston street, Boston.

The Knickerbocker Motor Truck Manufacturing Company, New York City, is completing a new concrete factory building on East 150th street, near the Harlem river.

The M. M. Automobile Automatic Safety Signal Company, New York City, has been capitalized at $50,000. The incorporators include J. C. McGee, W. F. Rawlins and I. M. Black.

The Whitmore Auto-Gear Composition Sales Company, Jersey City, N. J., has been incorporated for $100,000. The incorporators include B. S. Mantz, J. R. Turner and L. H. Gunther.

The Victor Buggy & Top Company, St. Louis, Mo., has been incorporated for $2000 to deal in carriage and motor car tops. The incorporators include Oliver E. Carter, Roscoe Perdue and Frank Roband.

The Efficiency Supply Company of Boston has been organized with a capital stock of $5000. The officers are as follows: President, William H. Murphy; treasurer, Francis J. Coughlin, and M. F. Curran.

The N. S. W. Motors Company of Indianapolis, Ind., has been incorporated for $60,000 to manufacture automobile parts. The directors include Charles Nesom, Louis Sagalowsky and F. W. Wellman.

The Standard Tire & Automobile Company, Plainfield, N. J., has been capitalized at $25,000 to manufacture motor vehicle tires. The incorporators are as follows: H. P. Visseller, J. J. Slevin and F. Ivamy.

The Standard Tire & Rubber Company, Springfield, Mass., was incorporated recently for $10,000. The officials are as follows: President, William Cronin; treasurer, Wayne E. Hughes, and James S. Waddell.

The Los Angeles Automobile & Taxicab Livery, Los Angeles, Cal., has been incorporated for $75,000. The incorporators include Belle F. Lewis, Harty E. Jones, Evelyn Jones, Charles M. Lewis and William H. Lewis.

The Available Truck Company, Chicago, has been incorporated for $25,000 and will manufacture motor vehicles and parts thereof. The incorporators named are: E. F. King, A. H. Wiedhofft and R. C. Hume.

"Graphite," which publication is devoted to the interests of the Joseph Dixon Crucible Company, Jersey City, N. J., contains in the current issue, some interesting applications of graphite to the motor car.

The Corbin Motor Vehicle Company, New Britain, Conn., has completed a new ambulance for the city of Waterbury, Conn. It is equipped with modern conveniences and is propelled by a 40 horsepower motor.

The Essex Rapid Transportation Company, Boston, Mass., has been incorporated for $50,000 and will engage in a general trucking business. The incorporators include George E. Lovejoy, James J. Murphy and George B. Cook.

The Rowe Motor Company, Coatesville, Penn., will be reorganized in the near future under the name of the Rowe Motor Manufacturing Company, and will produce commercial vehicles in larger numbers than heretofore.

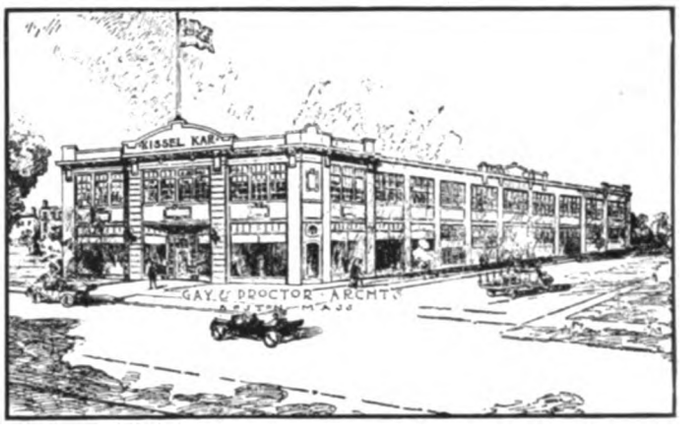
The Chase Motor Truck Company, Syracuse, N. Y., has completed a three-story addition to its plant, 80 by 140 feet. It will be utilized for the assembly of commercial cars.

The Baker Motor Vehicle Company, Cleveland, O., announces that it has secured the services of William P. Kennedy, the well known consulting electrical engineer of New York City to act as superintendent of the bureau of service efficiency.

The Copithorn Demountable Rim Company, Natick, Mass., has been incorporated for $100,000 to manufacture and sell tires and demountable rims. The incorporatros and directors include President Harry M. Ferguson and Louis C. Smith.

The Connecticut Telephone & Electric Company, Meriden, Conn., maker of Connecticut ignition specialties, announces the opening of an office, stock and show room at 231 West 54th street, New York City, where a full line of parts, etc., will be carried.

The Gramm Motor Truck Company, Lima, O., has an interesting and well illustrated special story upon the adaptability



New Home of the New England Branch of the Kissel Motor Car Company of Hartford, Wis., Which is Expected to Be Finished by Aug. 1.

of commercial vehicles to the furniture industry, in the February issue of "The Gramm," a publication issued by the Lima concern.

The Cleveland Taxicab Company, Cleveland, O., maintains a large fleet of these vehicles and in the accompanying illustration is depicted some of the automobiles in service. The cars are the product of the White Company, Cleveland, O., which makes a specialty of mechanical transports, both for passenger and freight service

The Morse-Readio Company, Springfield, Mass., has acquired a tract of land between Chestnut and Dwight streets and will erect a six-story building which will be of fire proof design. The concern handles the G. M. C. line of commercial vehicles, as well as pleasure cars.

Amos J. Shorey, northern Maine representative of the Velie line, has appointed Frank Mitchell sub-agent. The latter will establish a service station. J. T. Curtiss & Co., Velie agent for Simsbury, Conn., has closed with Tucker & Palmer of Tariffville, Conn., as sub-agent in that place.

The Lippard-Stewart Motor Car Company, Buffalo, N. Y., announces the appointment of the following new agencies: Neely & Ensor, Baltimore, Md.; Edward W. Jennings Company, Bridgeport, Conn.; Michigan Motor Company, Portland, Ore.; Whitten Motor Vehicle Company, Providence, R. I.

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The Lauth-Juergens Motor Car Company, Fremont, O., has decided to add to its capital stock and to utilize the proceeds in increasing the output by erecting large additions. A branch factory will be constructed at Gibsonburg, where the residents have subscribed for $50,000 worth of stock.

The Amalgamated Motors Corporation, Los Angeles, Cal., has been incorporated for $1,000,000. The directors include W. M. Varney, C. B. Croner, Robert McKee, Ernest Kouwenhoven, R. P. Craig, C. L. Woodbury, R. F. Davis, L. Scheer, C. F. Schroeder, J. A. Craig, T. W. Beddo, J. L. Kirkham, Thomas Carmody, Jr., J. B. Price and N. E. Masson.

James Drummond of Newburyport, Mass., has become identified with the Drummond Motor Car Company of Omaha, Neb., which concern will move into its new building at 324 South 18th street, about May 1. The company is agent for the G. M. C. trucks, and the officials are: President, W. R. Drummond; vice president and general manager, James Drummond; treasurer, L. W. Schieble; secretary, W. B. Hughes.

Fred J. Titus, who for the past year has been connected with the retail department of the American Locomotive Company of New York City and Providence, R. I., is now associated with the wholesale department. He is well known to the automobile trade having left the bicycle industry for that of motor cars when the latter was in its infancy.

The Remy Electric Company, Anderson, O., announces that arrangements have been made whereby Child, Day & Churchill, Inc., Spokane, Wash., the Washington Auto Supply, Seattle, and the Archer & Wiggins Company, Portland, Ore., will act as Remy service stations in their respective cities. Each will carry a full complement of the Remy ignition products as well as retain a corps of skilled experts.

The Parker Transmission Appliance Company, Springfield, Mass., which is capitalized for $1,000,000 to manufacture a device to eliminate the friction between gears, expects to occupy new quarters on the top floor of the Hunters Arms factory shortly. The product to be manufactured is the invention of Clark Parker of Springfield, and the transmission and clutch are of the constant mesh type.

The Horst & Strieter Company, Davenport, Ia., announces the opening of a new garage at 1417 Second avenue, where special attention will be paid to the care and maintenance of trucks. The company handles the G. M. C. line, manufactured by the General Motor Truck Company, Detroit, and maintains a service station for these vehicles. Henry W. Horst is president of the Davenport concern, Henry T. Horst, vice president, and M. E. Strieter, secretary and treasurer.

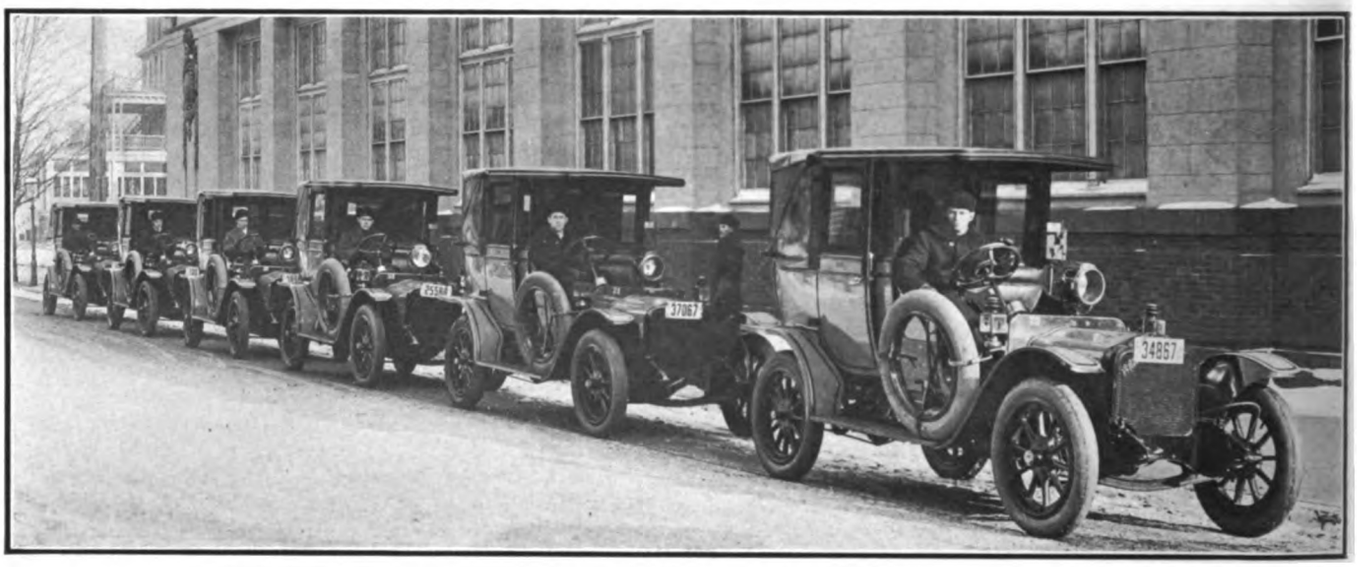
W. E. Darrah, president of the New Hampshire Auto Company, Concord, N. H., has closed with Robert Kayser of the Velie Boston branch for the Velie agency in Concord and vicinity. A service station has been established. Walter Velie Johnson, Essex Junction, Vt., will represent the Velie commercial and pleasure line for 1912 in that place. He maintains service stations at Burlington and Essex Junction.

The Wayne-Haven Motor Car Company, New Haven, Ind., was organized recently with a paid up capital stock of $25,000. It was decided to move the machinery of the Woodburn Auto Company to New Haven and install the apparatus in a new factory building which will permit of a larger production of trucks. At the meeting the following officers were elected. President, Allen M. Hartzell; vice president, Sherman H. Grubb; secretary-treasurer, Samuel J. Stocks. The directors are Conrad Buhr, Allen J. Pond, Herman Messman, William F. Keller and Jonah Adams.

The P. H. P. Motor Truck Company of Westfield, Mass., has been acquired by W. S. Magill, Guy Osborne and I. P. Miller, all of New York, and will be reorganized as the Westfield Motor Truck Company with a capitalization of $150,000, of which $50,000 will be preferred stock. The new company will continue in Westfield and plans to build 300 machines this year. The original truck was designed by Dr. A. B. Pendleton and its manufacture has been carried on for over a year. The Atlantic Motor Truck Company of New York City will have charge of the sales in New York and vicinity.

C. F. Splitdorf, New York City, maker of ignition specialties, has issued an interesting brochure containing a resume of the performance of cars equipped with Splitdorf ignition in competition on road, hill and track, which provides a useful reference work of racing performances in general and the 1911 season in particular. The records are exhaustive and authentic and with numerous illustrations bring out the Splitdorf victories, including world's records, etc. A free copy of the booklet may be obtained by applying to C. F. Splitdorf, 138th street and Walton avenue, New York City.

The Schildwachter Carriage Company, Park avenue and 128th street, New York City, has taken over the exclusive eastern agency for the Sternberg trucks, made by the Sternberg Manufacturing Company, Milwaukee, Wis., which concern makes two, three, four and five-ton power wagons. In addition to the Sternberg the Schildwachter Carriage Company is agent for the McIntyre line.



Fleet of White Taxicabs, Made by the White Company, Cleveland, O., in Service with the Cleveland Taxicab Company of That City.

The Mais Motor Truck Company, Indianapolis, Ind., announces the resignation of C. H. Wallerich, general sales manager. He has been identified with the automobile industry for several years, having been connected with the makers of Marion, Haynes and Overland cars. It is stated that he has accepted a position as manager of the automobile department of the newly organized General Industrial & Manufacturing Company. The latter was incorporated recently for $1,000,000 and will produce delivery vehicles of 1000 and 1500 pounds capacity. T. B. Laycock, a well known manufacturer of Indianapolis, is president of the concern.

The Kissel Motor Car Company, Hartford, Wis., is erecting a new home for its New England branch at Commonwealth avenue and Pleasant street, Boston, of which H. B. Pruden is manager. The new structure will be 74 by 200 feet and will be equipped with modern conveniences for the care and maintenance of the product of this concern. The plans call for an exceptionally fine salesroom, which will have a frontage of 74 feet and a depth of 70. The garage will occupy the rear of the first floor and here modern appliances will be installed. Directly off this will be a room for the chauffeurs. The service shop will be located on the second floor where up-to-date machinery will be operated by electricity. A feature will be the fitting of a trolley system for handling of heavy parts. The front portion of the second floor will be utilized as a display room for commercial cars. The building is expected to be ready for occupancy about Aug. 1, and in the accompanying illustration is depicted the architect's drawing of the structure.

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TRUCK REGISTRATION IN MASSACHUSETTS.

IN RESPONSE to a special message from Governor Foss of Massachusetts, the sub-committee of the legislative committee on highways and bridges has formulated a bill, in which the fees for registration in that commonwealth are to be increased materially. The proposed legislation contemplates the following: From five to 10 horsepower, 30 cents a horsepower; 10 to 29, 40 cents; 30 to 39, 50 cents; 40 to 49, 75 cents, and 50 and over, $1. The Massachusetts State Automobile Association has undertaken to defeat the bill, President L. R. Speare having addressed a letter to the various motoring organizations in the state, his reference to motor trucks being as follows:

"In regard to commercial vehicles: We are informed that the same rate is to apply to these. This is manifestly unfair. After a great deal of consultation with different manufacturers of motor trucks we do not believe that horsepower is a fair scale to work on in regard to commercial vehicles. The proposition is a different one from that of pleasure vehicles. Some five-ton trucks, for example, have 35 horsepower, some have 40 and some 48.6. Each carries the same load and makes the same rate of speed.

"Manufacturers agree that 12 miles an hour is the speed that a truck should make, and that it should not be driven at a higher rate. If the 48.6 horsepower truck were rated at 49, the fee would be $36.75, the 40 horsepower would pay $30 and the 35 horsepower would pay only $17.50, while doing equal damage to the roads in every respect. In other words, the 48.6 horsepower motor truck is obliged to pay more than twice as much as the 35 horsepower truck, simply because it has a larger engine. It goes no faster, carries no larger load and does no more damage to the road.

"We have, therefore, suggested the following scale for motor trucks, which would make an enormous increase in the amount of registration, and it seems to us would be much fairer than the scale proposed: One ton, $5; two, $7.50; three, $10; four, $12.50; five, $15; six, $17.50; seven, $20; eight, $22.50; nine, $25; 10, $27.50; over 10 tons, $50.

"It is doubtful if a motor truck will be built that will carry over 10 tons, but if the manufacturers should conclude to put on a jumbo we believe they should pay for it, as the roads are not fit to carry over a 10-ton load at the present time. The fee would be based upon the tonnage guaranteed by the manufacturer for the truck. He could not guarantee it to carry a small amount, as he would not be able to sell the truck, and the tax would not be so large that there would be any object in so doing."

FEDERAL TRUCK HAULS FIRST LOAD.

Work has been commenced upon the site for the International Panama-Pacific Exposition which will be held at San Francisco, Cal., in 1915. The first load of lumber to be delivered to the ground was furnished by the San Francisco Lumber Company which utilized a Federal truck, made by the Federal Motor Truck Company, Detroit. In the accompanying illustration is depicted the machine about to start on its trip to the exposition grounds.

The car is propelled by a four-cylinder, four-cycle, water-cooled motor of the L head type having a 4.25-inch bore and 4.5-inch stroke and is rated at 30 horsepower. Ignition is by an Eisemann high-tension magneto and lubrication is by constant level splash and gear pump.

A leather faced cone clutch is employed with auxiliary springs and power is transmitted through a selective sliding gear providing three speeds forward and reverse. Final drive is by side chains. The front axle is of the I beam section type and the rear member square. Timken bearings are employed. The tires are solid, 36 by 3.5 inches front and 36 by four inches rear. The driver's position is at the left with left hand control.



Federal Truck Hauling First Load of Lumber to Panama-Pacific Exposition Grounds at San Francisco, Cal.

NEW YORK'S ANNUAL PARADE.

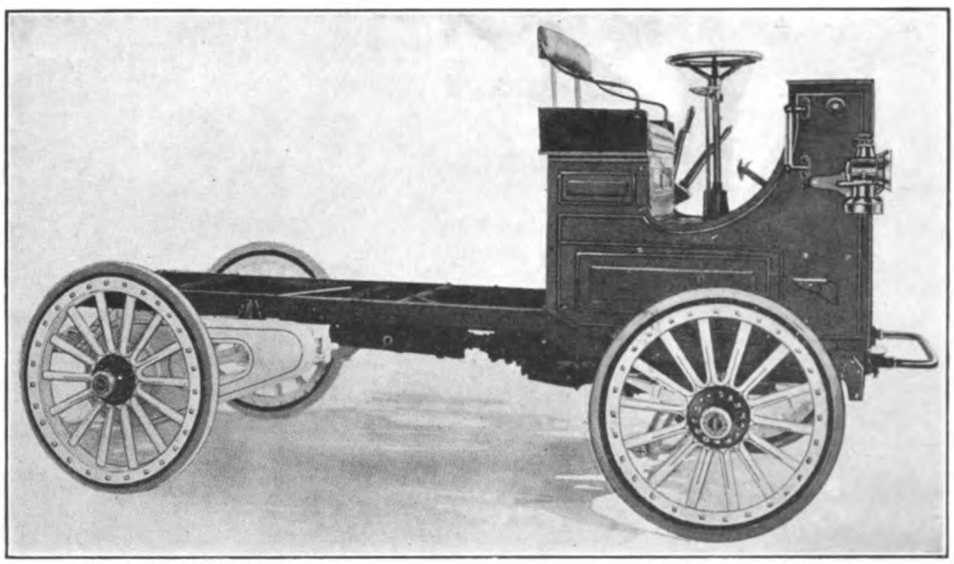
Preparations for the annual commercial vehicle parade in New York City under the auspices of the Motor Truck Club, April 13, are progressing satisfactorily, and the committee reports that it already is assured of more cars than have ever taken part in a similar event in this country. Most of the leading dealers have shown a disposition to co-operate with the club in the enterprise and have urged their customers to join in the plan. Entirely aside from the trade, however, the club is anxious to get as large a representation of individual owners as possible, and to this end a special invitation is issued to all owners, the committee according these a broader opportunity for advertising their own business than the dealers themselves. The chief object is to make an effective showing of motor truck representation in this centre, as an encouragement for the extension of commercial vehicle use.

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FEATURES OF SANDUSKY 3000-POUND WAGON.

THE Sandusky 3000-pound delivery wagon, built by the Sandusky Auto Parts and Motor Truck Company, Sandusky, O., is designed with a view of minimizing the time required for care and attention, this economy being possible through unusual accessibility and simplicity of construction without the sacrifice of any desirable quality. Only one type is now built, but the company is to produce, as soon as this can be brought about, a lighter and a heavier vehicle, which will be practically of the same design.

The chief feature is in the manner of installing the unit power plant, which can be withdrawn from the chassis in 10 minutes without the use of special facilities or tools and by one man. The replacement may be made in no longer time and without assistance. A spare engine and auxiliaries may be installed in a vehicle frame, replacing one that may be inefficient, in 20 minutes. This means that with an extra power plant the owner of several wagons will always have a reserve that would not be possible with machines of conventional construction. There is nothing freakish in the design. It is based on sound engineering, and there is a margin of safety in every respect.



The Sandusky Model C Delivery Wagon Chassis, with Load Capacity of 3000 Pounds.

The motor, clutch and transmission as a unit is mounted in a sub-frame whch also carries the radiator and gasoline tank and their connections. The exhaust manifold connection with the muffler is telescopic, and the driving shaft is so coupled with the transmission shaft that by the release of a retaining sleeve the coupling may be dropped. The lifting of the steering column and the disconnection of the clutch and speed change levers leaves the assembly free in the chassis frame. Then by raising six spring-controlled plungers and operating two levers that lower the sub-frame onto rollers, the frame and power plant may be drawn out of the chassis frame. Placed on blocks or horses work may be performed with the best of light and without obstruction. Every part is absolutely free to the workman. When work has been completed the sub-frame is installed in the chassis by a reversal of the process outlined.

It is claimed by the maker that the materials used are of the highest quality, 3.5 per cent. nickel steel, chrome nickel steel and vanadium steel being employed for all purposes where steel would ordinarily be utilized. All parts are machined to exact gauge with special machine tools, insuring accuracy of work and interchangeability of parts. Thorough inspection makes possible the maintenance of this standard of production, both in the components and the assembled work.

The motor is a four-cylinder, water-cooled, four-cycle L head type with bore of 3.75 inches and stroke of five inches. This is rated at 22.5 horsepower by the S. A. E. standard formula, but will develop considerably in excess of this being specified as 25-30 by the maker. The cylinders are cast en bloc and with the heads and the water jackets integral. The valve pockets are at the right side. The water jacketing is unusually large and the greater part of the outer wall of the cylinder heads above the combustion chamber is in the form of cast cover plates, each pair of cylinders being served by one plate. The cylinders are cast of a soft gray iron of superior grade. The core sand may be thoroughly removed through the large water jacket vents, this construction obviating the possibility of obstructions to circulation and facilitating cleaning or repair. The cylinder block is bored, reamed and after ageing is ground to precise diameter. The water jacket cover plates are fitted and the water tight joint is insured by gaskets, each plate being held by a pair of hollow studs that are centred in the combustion chambers. Into these studs are fitted the compression relief and priming cocks. The cylinders are offset .75 inch with reference to the centre of the crankshaft.

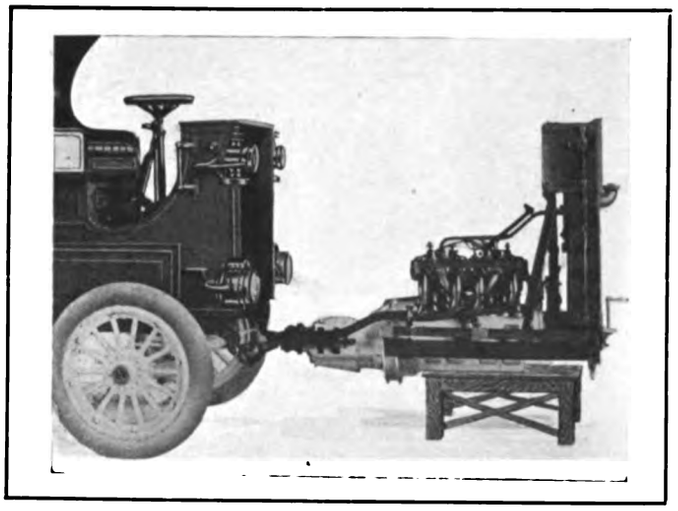
The pistons are cast of a special gray iron and after turning are ground to the exact size. The pistons are channeled to limit gauges for four .25-inch rings that are bored eccentric and are ground on both edges and the peripheries to the gauged size. Extreme care is taken to insure perfect castings.

The crankcase is in three sections, these being the upper and lower halves of the barrel and the cover or case for the timing gears fitted at the front, but the rear ends of the case are extended to form the housing for the flywheel, and to the heavy flange at the end of the extension is bolted the housing for the clutch and transmission assembly. There are two large handholes at the top of this rear case above the clutch and the transmission. This casing when assembled contains the entire mechanism of the power plant. The material used is an aluminum alloy that has extreme strength. At the forward end of the crankcase and at either side of the flywheel case are very strong arms that support the assembly in the sub-frame, they being bolted to the sturdy side members.

The upper crankcase section is divided by a transverse web of heavy section and is strengthened by bridgework. The lower half is similarly divided with compartments directly beneath each crankthrow, and contains the oil reservoir. The top half ends and the central web carry the large main bearings, the camshaft and its bearings, the timing gears and their housing.

The crankshaft is a special analysis nickel steel drop forging with the flywheel flange forged integral, which is heat treated and is ground to limits for all bearings. The shaft bearings are of large diameter and length and are of a fine quality of bearing metal. The bearings are retained by heavy bolts and castellated nuts, four at each

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Unit Power Plant of Sandusky Delivery Wagon Withdrawn from the Chassis for Examination.

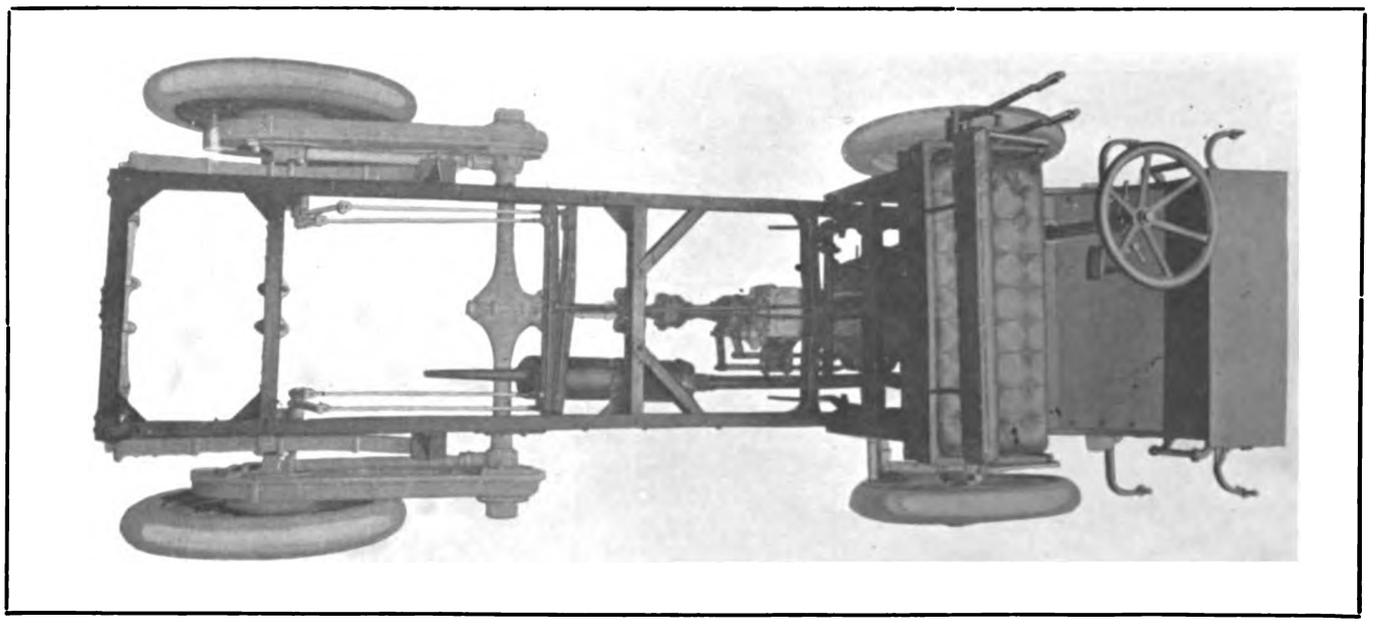
end and two at the centre bearing. The camshaft is special analysis nickel steel drop forging with the cams integral. This is hardened and ground to limits, this insuring the size of the three bearings and the accurate formation of the cams and certainty of valve timing.

The connecting rods are steel drop forgings of I section that are fitted with die cast phoenix metal bearings at the crankpins and with bronze bearings at the wristpins. The wristpins are steel tube, carbonized, hardened and ground and are fitted into the piston bosses and retained by large cotter pins. All pistons, wristpins and connecting rods and their bearings, are weighed and, when assembled, perfect balance of the reciprocating parts is insured. The valves are of large size to obtain positive exhaust of the burned gases and to secure adequate charges of the fuel gas. The heads are of 3.5 per cent. nickel steel welded electrically to carbon steel stems. The valves are accurately ground and the stem ends are case hardened. The valve lifters are of steel and the cam contacts are steel rollers, hardened and ground, revolving on hardened steel pins. The valve stem contacts are fitted with adjusting screws and lock nuts and with fibre inserts to eliminate noise. The valve lifters are set in die cast guides that are held in the engine case by crab yokes. The valve guides are iron castings pressed into the cylinders. These guides can be replaced when worn. The timing gears are with wide faces, that at the right side driving the camshaft, and that at the left side driving the water pump, an outside extension of this shaft driving the magneto.

The engine is cooled by the circulation of six gallons of water through the large jackets of the engine, forced by a centrifugal water pump of unusual size. The water enters the cylinders at the base of the jackets through a two-way inlet and the liquid is directed around the cylinders, and then flows outward through a manifold with outlets located in the centre of the twin cover plates over each pair of cylinders. The manifolds are copper tube with rubber unions. The water is cooled by a tubular radiator of stout construction and radiation is increased by a six-bladed aluminum fan that is carried on a bracket located forward of the cylinder block. This bracket has a block carrying the ball bearing for the fanshaft that is supported by two strong helical springs surrounding the guides for the block. The fan is driven by a flat belt from a pulley on the crankshaft extension and any lengthening of the belt through wear or stretching is compensated by the springs supporting the fanshaft bearing block.

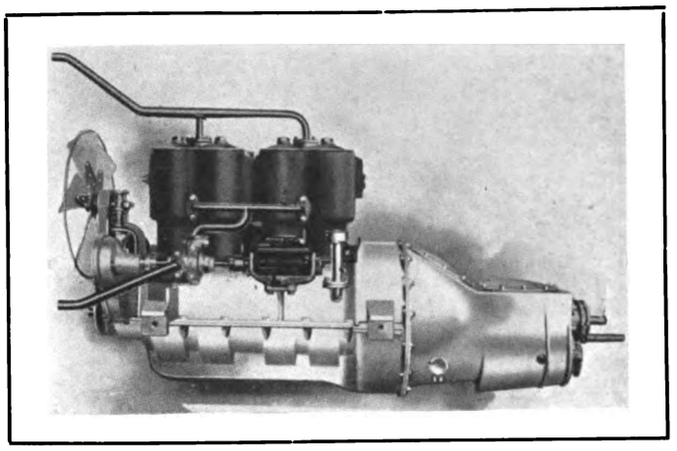
The lubrication of the engine is by splash with flywheel distribution. The reservoir integral with the base of the crankcase is filled with oil and this is so designed that a limited quantity flows into the base of the compartment in which the flywheel revolves. This oil is carried upward by the flywheel and drains into a series of ducts cast in the upper and lower sections whence it is distributed to the pits under the crankthrows. The sweep of the connecting rod ends into the oil pits causes a spray of oil to fill the engine case, lubricating the main, camshaft, connecting rod and wristpin bearings, the cams, valve lifters, the timing gears and the cylinder and piston walls. The timing gear on the crankshaft is driven in an oil pocket and from this the other gears are constantly lubricated. The excess oil is drained into the oil reservoir and is again carried through the system.

The ignition is by a high-tension Mea magneto that is driven by a coupling from the water pump shaft. In this instrument the advance or retarding of the spark is accompanied by rocking the magnets, which produces a uniform spark at all speeds. It is claimed that there is no position of the ignition lever at which the engine may not be started by the magneto without difficulty and for that reason there is no other means of ignition necessary. But one set of



Plan View of the Model C Sandusky Delivery Wagon Chassis, Showing the Chain Cases and the Radius Rods.

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Left Side of the Sandusky Unit Power Plant, Showing Water Pump, Magneto and Fan Bracket with a Spring Maintained Belt Tension.

spark plugs is used with this installation.

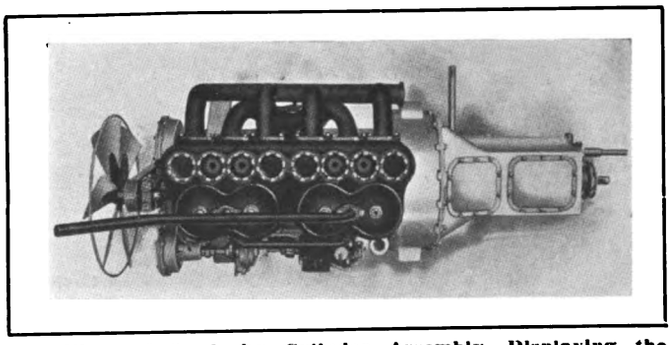
The carburetor is a float feed automatic type that will produce a uniform quality of gas at all engine speeds. The inlet manifold is very large and with straight leads to each pair of cylinders, the fresh gas sweeping the electrodes of the spark plugs and cooling and cleaning them. The distribution of gas is very even. The fuel is fed by gravity from a tank of 12 gallons capacity. The radiator is carried on spring supports in a frame at the front end of the sub-frame on which the power plant assembly is installed. Above this and similarly mounted on springs is the gasoline tank. The connection with the carburetor is a large copper tube in which is a strainer and shut-off cock. There is a sight feed gauge on the dash that shows the quantity of fuel remaining in the tank.

The clutch is of the cone type. The cone member is faced with asbestos fabric that cannot be affected by heat and its efficiency is not impaired by saturation of oil, while there is a cushioning effect at engaging caused by flat springs beneath the facing, that insures against all jars and jolts. The clutch spring is strong but the operating levers are so compounded that its operation is very easy.

The transmission is a selective design giving three forward and one reverse speeds. Both the driving and the counter shafts are of chrome nickel steel, hardened and ground, and they are mounted in high grade annular ball bearings. The gears are 3.5 per cent. electric furnace nickel steel, with broad faces, long hubs and accurately cut stub teeth of large pitch. The fixed gears are keyed to the shafts.

This entire assembly is carried by the sub-frame and by the removal of the sub-frame from the chassis in the manner described, work may be performed on any one of the groups without breaking any connections and without disturbing the relations of the different members. No tools or wrenches are necessary.

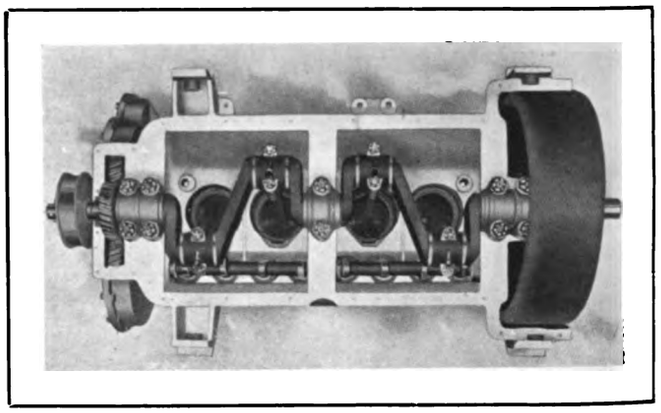
The transmission driving shaft is coupled to the main



Top View of Sandusky Cylinder Assembly, Displaying the Large Plates Covering the Water Jackets and the Flywheel and Transmission Cases.

driving shaft by a movable sleeve or collar that may be quickly disconnected. Back of this is a universal joint, then the main shaft, a second universal joint and then the pinion shaft. The shaft is supported from the centre cross member of the chassis frame. The drive is by a pinion and bevel gear to the jackshaft. The jackshaft housing is pressed steel. The differential cage is mounted on Timken roller bearings that are adjustable. The driving shafts are chrome vanadium steel, heat treated. The final drive to the dead rear axle is by double side chains that are enclosed in dust and water tight cases that are packed with grease. The operation of the chains is noiseless.

The chassis frame is a special design of chrome nickel steel, channel section, two inches depth and four inches width, .125 inch thickness. It is well braced by cross members and gusset plates. It is dropped in front to carry the sub-frame of the unit power plant. The front springs are semi-elliptic, 40 inches length and two inches width, with 10 leaves; the rear springs are three-quarters platform, the side members being 40 inches length and two inches width and the end member 36 inches length and two inches width, eight leaves, with an auxiliary spring over the rear axle 36 inches length and two inches width, of six leaves. All springs are vanadium steel. The rear axle is a rectangular drop forging of 3.5 per cent. nickel steel with the wheel spindles fitted with Timken roller bearings. The front axle is a similar forging with Elliott type yokes with a roller



Bottom View of the Sandusky Engine Case, with the Big Main Bearings and the Spiral-Cut Timing Gears.

thrust bearing at the top of the steering knuckle. The wheel spindles are fitted with Timken roller bearings of large size. All the wheels are fitted with cast steel hubs with generous flanges at the spoke butts. The relation of the rear axle is preserved by heavy radius rods that are attached to the rear axle and to the jackshaft housing. The wheels are artillery type, with 14 spokes, and are 40 inches diameter for solid tire equipment and 36 inches diameter for pneumatic tires.

The control is by a hand wheel at the top of a vertical steering column that can be lifted from its connections for the removal of the power plant, by a clutch pedal and a service brake pedal, hand levers that change speed and operate the emergency brake, and fuel throttle and ignition levers mounted on the steering column below the wheel. The steering connection is a double screw type of substantial construction, all wearing parts hardened, with adjustments for compensating wear. The brakes are internal expanding, the shoes being faced with thermoid. The brakes are large and have great endurance. The drive is at the left side and the hand levers are mounted at the side of the driver's seat outside the frame. The speed of the wagon is 15 miles with solid tires and 20 miles an hour with pneumatic tires. The wheelbase is 106 inches and the tread 56 inches. The turning radius is 40 feet. The loading platform is from 42 to 56 inches width and eight to 10 feet length. The normal capacity is 3000 pounds.

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MACK IN NEVADA MINING SERVICE.

The Jersey Valley Mines Company, Battle Mountain, Nev., has been operating a Mack truck, made by the International Motor Company, at its Mack plant in Allentown, Penn., in mining service during the past year, and the result of this experiment, for such it was regarded by the owner, is told in the following extracts from a letter from William F. Pinkham of the mining concern:

"To begin with: The truck, loaded at Newark, N. J., arrived in good shape, 14 days after shipment. We immediately filled the gasoline tank, started it on the second turn of the crank and began clearing the freight yard of the accumulation of mining machinery, lumber, provisions, etc. All of the adjustments were perfect as sent from the factory. The following day we gave it a trial with distillate as fuel, the only adjustment necessary being the addition of a hot air intake carburetor, leading directly around the exhaust pipe, this being required for the proper vaporization of the heavier fuel.

"Our first trip over the desert road was one of construction. We fastened behind the car a drag made of two nine-foot lengths of 90-pound railroad rail, and dragged this over the 46 miles of road to the mines, a gang of four men following to remove loose stones, etc. This was an attempt to smooth the road and fill the deep ruts made by the freight wagons, in which we were successful, but as there has been no rain in this country since April 16 all the soil we filled into the ruts is now a mass of fine dust, through which we plow to a depth of 12 to 14 inches in many places.

"It is hard, unless one actually has travelled over these desert roads to imagine just what they are like, particularly as you have nothing like them in the East, and I give you this description, as it is of course necessary in order properly to appreciate the performance of the truck.

"Our road lies down the length of a valley with high mountains on either side, and in the month of March, when the snow melts rapidly from the mountain sides, many brooks and small rivers flow down into the valley and across our roadway, with the result that after years of this treatment, the road is crossed by many gullies and brook beds from three to 10 feet deep, few of which have banks less steep than 45 degrees. This is the usual condition of all the roads throughout this state, and is considered inevitable, although in time we hope to improve this particular road greatly.

"Our running time has been 9.5 hours going out with a load and seven hours coming back empty. The time taken by a mule team with a six-ton load and 12 mules, is three days going and two days coming back, the freight charge being $20 a ton. A day's rest is necessary between loads. Therefore, while the mule team is delivering six tons, we can deliver 15 tons with the truck. The difference in cost a ton can be imagined easily.

"As far as the power goes, we could cut the above time much further, but would consider it rank abuse of a good machine to do so with the present roads. In fact, had we not such an accumulation of freight whch is needed at the mine, we would keep the truck off the roads entirely, until we could get rain to harden them and make travel more comfortable."

STANDARD OIL BUYS G. M. C. TRUCKS.

One of the best arguments in favor of the commercial vehicles is the fact that large corporations are replacing their horse drawn equipment with the mechanical transport. These concerns watch operating expenses very closely. They must be kept to a minimum and the adoption of trucks means that the heads of the companies have investigated the automobile and are satisfied that it is both efficient and economical.

The Standard Oil Company has placed a large number of trucks in operation at its different branches and recently installed a fleet of 3.5-ton G. M. C. trucks, made by the General Motors Truck Company, Detroit. In the accompanying illustration is depicted one of the machines of the fleet installed at Kansas City, Mo. Specially constructed sills are fitted to the frame for the purpose of carrying large oil tanks as will be noted in the picture.

The driver is protected from the weather by an ample sized cab which is enclosed by means of curtains, and a feature of the construction of the top is a projecting bonnet, which, like the top, can be folded back. The vehicle is propelled by a four-cylinder, four-cycle, water-cooled motor having a five-inch bore and five-inch stroke, rated at 40 horsepower. A feature of the power plant is that it is removable, being mounted upon a main sub-frame. Ignition is by Mea magneto with storage batteries in reserve and dual ignition is provided by two sets of spark plugs. Lubrication is by splash. A multiple disc clutch is utilized with a progressive type of transmission, this providing three speeds forward and reverse. Final drive is by side chains. Two sets of brakes are fitted, of the expanding and contracting type, these being located on the rear wheels. The front springs are semi-elliptic with platform at the rear, and an auxiliary member is also fitted.



One of a Fleet of 3.5-Ton G. M. C. Trucks in Service with the Standard Oil Company at Kansas City, Mo.

NEW MOTZ TIRE AGENT.

The Motz Tire & Rubber Company, Akron, O., maker of Motz tires for gasoline and electric commercial and pleasure vehicles, announces the appointment of the Standard Tire & Rubber Company, 104-106 Portland street, Boston, as its representative in that city and vicinity.

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EFFECT OF SPEED ON TIRES.

Experts interested in the commercial vehicle because of its economic possibilities are agreed that the driver who throws discretion to the winds and operates his truck at an unreasonable speed is unquestionably the most expensive feature of the maintenance account. Tire manufacturers, in particular, attack the speeding driver and his methods. They argue that speeding is by all odds the most important of all deteriorating influences to which tires are subjected. Commenting upon this situation, F. F. Phillips, manager of the solid tire department of the United States Tire Company, New York City, says:

"Beyond any question of doubt, the speed maniac is a menace to the truck industry. Putting aside every other consideration—wear and tear on machinery, endangering the lives of pedestrians and violation of sane traffic rules—the speeder is an undesirable party for the reason that he costs his employer a great deal of unnecessary money.

"It makes no difference how well solid tires are made or to what extremes the manufacturer goes to fortify them against the incessant knocks of road travel, they will not withstand the abuses of the speed maniac. Speeding is an evil that can result in but one thing—decreased tire mileage and increased tire expense.

"Demonstration has proved that at an average speed of 12 miles an hour the life of a tire is about twice what it is at an average speed of 20 miles an hour. Still higher speeds reduce the life of the tire proportionately. Therefore it should not require any great amount of meditation to determine the effect of constant speeding upon the owner's tire bills.

"There are a great many conditions and abuses calculated to shorten the life of a solid tire, but of all these I have no hesitancy in placing speeding at the top of the list. Every manager of a motor service should insist upon strict observance of moderate speeds. Economical tire service can be secured in no other way.

"As a simple illustration of the effect of fast driving on solid tires, take two locomotives travelling at a speed of say, five miles an hour, and bring them into collision. The result is not serious. However, if you take these same locomotives, travelling at the rate of 30 miles an hour, and jam them together, something is bound to happen. It is the same with solid tires. When a moderate speed is maintained, road obstructions are of slight consequence, but when the truck is sent along at a fast rate, the reverse is true."

KNOX BUILT FIRST TRUCK.

What is claimed to be the first gasoline motor truck was the three-wheeled delivery wagon constructed for the department store of Smith & Murray at Springfield, Mass., by the Knox Automobile Company of that city, in 1901. However, the owner of the first rubber tired motor truck was the Adams Express Company, which ordered a Knox truck for delivery in Worcester, Mass., Nov. 2, 1903, and a second one of the same make for New York City the following day.

Two of the earliest owners of Knox three-wheeled cars were men who have become famous as automobile designers. One of these was C. R. Creuter, designer of the Matheson, and the other, Charles Y. Knight, inventor of the Knight motor. The machine built for Smith & Murray in 1901 was the forerunner of a rapidly growing commercial vehicle business, and an offshoot is the fire apparatus line which has developed with leaps and bounds, until today nearly every large community in the country has one or more pieces while several cities and towns are completely changing over their equipment.

BRUSH FOR RURAL CARRIER.

In an effort to determine the relative cost of the automobile and horse equipment in rural mail delivery, a carrier on one of the routes leading out of Eldorado, O., recently selected a Brush runabout, made by the Brush Runabout Company, Detroit, a constituent of the United States Motor Company, with which to make the test. He found that the actual cost for gasoline and oil for the trip was 14 cents as against 60 cents for the horse and wagon.

In the first place it should be stated that the distance to be covered was 26.25 miles, and that 125 stops had to be made. The automobile completed the task in 2:35:00, while the horse needed approximately six hours. It will be seen that not only will the Brush runabout do this work at a saving of more than 200 per cent. in expense, but will give the carrier some three extra hours each day. He proposes to utilize the car in the livery business after finishing his day's work for the government.

ECONOMY AND EFFICIENCY.

Talk to a man in real figures and he will listen every time, especially if those figures refer to the cost of operating motor trucks. It is pretty generally recognized by commercial vehicle manufacturers today that it is an actual illustration of service cost under average conditions which makes its appeal, combined with a proved statement that the truck will cover more territory in a given time and consequently carry more goods. Here is an instance:

The Acme White Lead & Color Works of Detroit has had in operation for some time a five-ton G. M. C. vehicle, made by the General Motors Truck Company of that city, and since its installation has been keeping a strict account of its performance and operating cost. A statement issued recently by it proves interesting not only from an economical standpoint, but the comparison made with the horse system clearly emphasizes the advantages of the motor truck and the saving and efficiency resulting from its use. This particular G. M. C. took the place of two teams and two men, but for a month both systems were in operation in order to make the comparison.

While the two teams were only able to carry 250 tons of material during the month, the truck during the same period carried loads aggregating 780 tons, or three times more than the amount drawn by the horses. As to the territory covered, and this is one of the very important items, the teams negotiated 1144 miles against 1430 for the truck. It will be seen that the mechanical transport was able to cover a third more territory than the two teams.

The biggest surprise, however, was in the matter of expense. It took $229.16 to maintain the two teams, pay the drivers' wages and feed the horses. The motor truck involved an expenditure of $152.10. This included wages of driver, gasoline and oil. To summarize, it not only cost $77.06 less to maintain the power vehicle, but it was possible to cover 286 more miles and carry 530 more tons of material.

LAUNDRY BUYS VELIE CAR.

There is a growing tendency among laundries to adopt the commercial vehicle. The automobile has proved its efficiency and economy in this work where the deliveries are not confined to a few sections in the city. The Union Laundry Company of Worcester, Mass., recently experimented with motor cars and the results were so gratifying that an order was placed with the Acme Motor Car Company of that city for a Velie truck, made by the Velie Motor Vehicle Company, Moline, Ill.

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The MOTOR TRUCK
Devoted to Motor Driven Business Vehicles of All Classes.

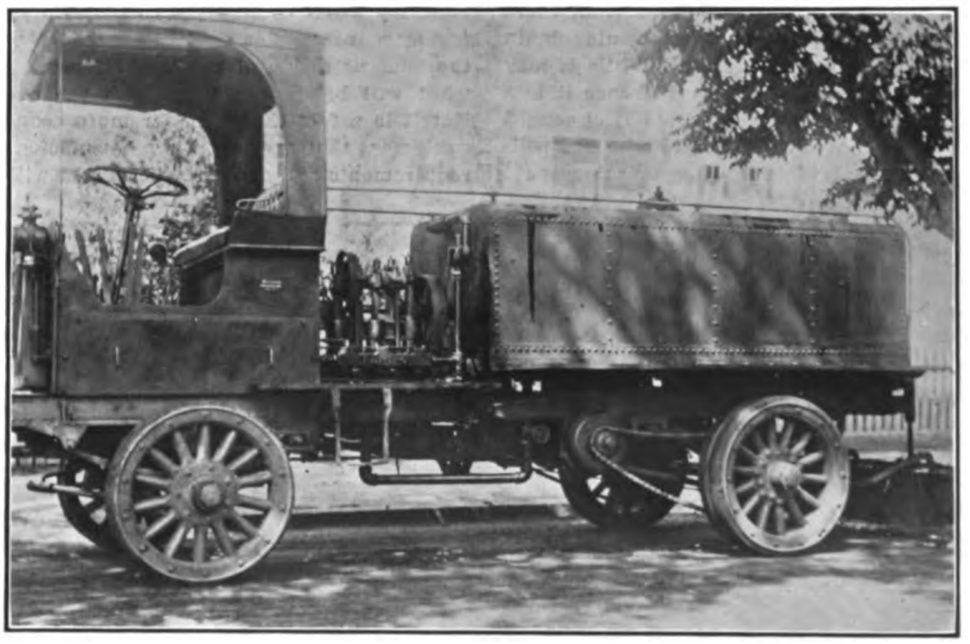
VOL. III. PAWTUCKET, R. I., MAY, 1912 No. 5

MOTOR EQUIPMENT IN MUNICIPAL SERVICE.

Experience of Pawtucket, R. I., Demonstrates That Substantial Economy and Undoubted Efficiency Result from the Use of the Mechanical Transport in the Street Department for the Suppression of Dust Nuisance.

EVERY municipality of proportions must afford to its citizens such service as its resources may justify. There is a wide variance as to requirements, but it is characteristic of American citizens to demand of a city or town whatever attention may appear desirable, it being assumed that the community as a whole ought to bear the expense of necessities or conveniences that in reality benefit a comparatively small number. Without question it is impossible to provide all that may be desired, but, aside from the matter of political expediency, there are certain classes of service that must be provided.

The municipal government must always regard its financial limitations, at least in theory, and the general experience has been that revenue is never adequate to provide all that is wanted by the citizens. There are certain divisions of the service that may with reason be restricted, temporarily, perhaps, while others must not only be constant but have a reasonable reserve to cope with such exigencies as may arise. While it is a fact that each citizen will unhesitatingly demand whatever may be considered a public or even a personal need, there is equal unwillingness to approve a rate of taxation that will yield sufficient revenue to meet all authorized expenses.



Gramm Truck Chassis Fitted with Tank and Pump for Street Oiling at Pawtucket, R. I., an Equipment That Has Supplanted 10 Water Tank Wagons.

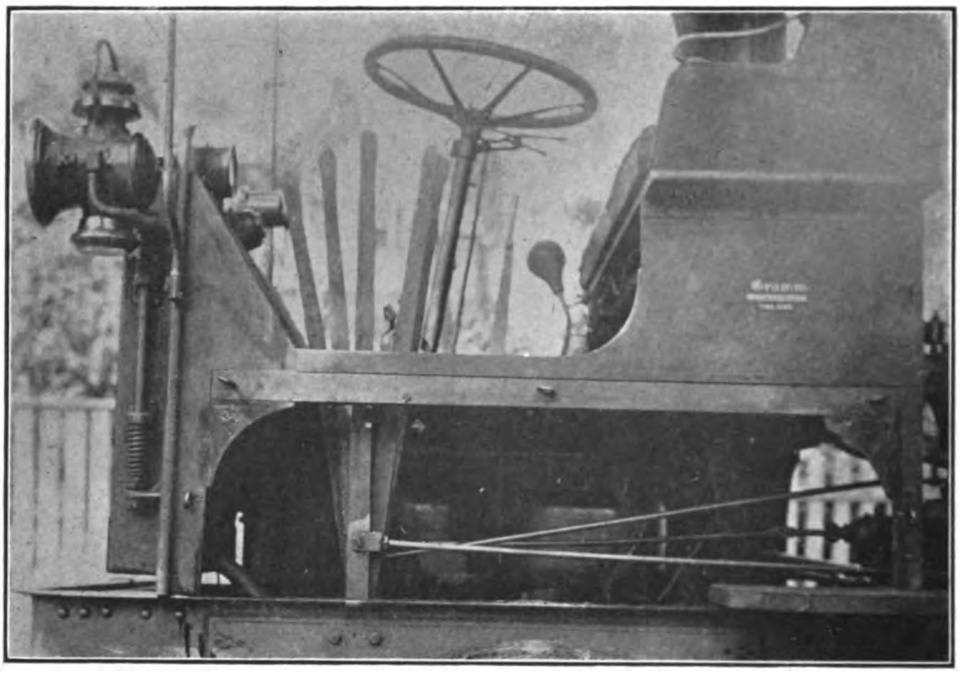
The community government usually has another handicap in the fact that political expediency has caused the enactment of state or local laws limiting the hours of labor, and as a rule the work that is performed is materially less than what might be accomplished by a private corporation or firm for a given price. This is stated for no other reason than to emphasize the necessity of economizing the time of those employed by municipalities. That is to say, with the limitation of appropriations and of the hours of labor, and with the demands in excess of the departmental capacities and constantly increasing, there is extreme need of facilities that will either better the service at no additional expense or accomplish an actual saving.

There are some divisions in which time is the greatest factor and of these the most important is that affording protection against fire. The utility of the motor driven apparatus is such there can be no argument made against its use, and for the police department the automobile vehicle is so superior to other forms that it is not necessary to expatiate.

In either of the two departments specified, where time is one of the most important factors in obtaining satisfactory protection, there could be no issue made even were the expense greater. With the first the main requirement has been sufficient capacity to supplant the largest and heaviest apparatus, there being some doubt as to the reliability and endurance of the motors in the absence of specific experience. So far as the second is concerned there has been abundant evidence to establish the superiority of the automobile.

It is outside of these two divisions that the power conveyance has been least used. There is apparently a belief that it is not practical to give over the use of horses and carts because of the class of work that is performed in

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Series of Hand Levers at the Left Side of the Driver's Seat by Which the Pumpage and the Distribution of the Oil Is Controlled.

street cleaning, street sprinkling, garbage collecting and other sanitary service, to say nothing of the varying construction such as street building, water works extension and maintenance, sewage system development and care, as well as other essential attention to city property.

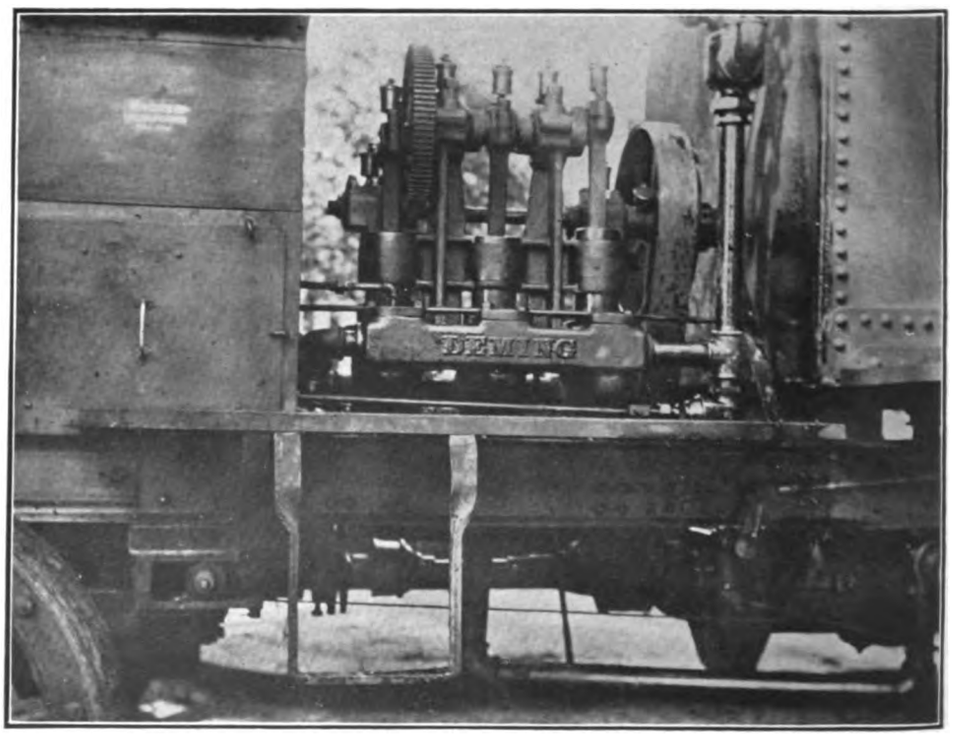
In regarding the average municipal expenditure and the possibilities for economy it must not be believed that there are the same incentives to save money that would obtain with the business of the private enterprise. While it may be that some will say there should be no difference it is a fact that economizing is often not so much the object sought as to furnish employment to deserving voters who are willing to do the least that is possible for wage or salary paid to them. Where this is the condition obtaining it is useless to advocate economical methods.

In any event it is not practical to expect to better or improve a service by the changing of apparatus—that is, from animal to mechanical vehicles—to any great degree. The mere possession of the equipment is one thing. The essential is to make whatever change is necessary in the manner of use to secure the greatest practical use and consequent economy. This is not a radical recommendation. It follows that there must be rejection of the old to take advantage of the new, and if there is to be merely an increase of the service without additional expenditure the public is distinctly a gainer.

It will be admitted that it would be idle to use trucks or wagons as carts are or have been used for street cleaning, for example, because there would be the waste of time in loading the refuse and dust from the highways and the only saving would be in the time of cartage. If the haulage were a considerable distance the motor truck would have the advantage of speed and capacity, which might be sufficient to equalize the expense, but there would not be a large measure of saving. Besides, the truck would, with a driver, do the work of several men and carts, which would mean less work for somebody.

To illustrate the matter of method it may be pointed out that once the streets were leveled by use of the shovel and hoe. Later came the harrow on the dirt ways. Next the paving was swept by hand brooms and the dirt carried away by carts. The horse brooms were the next facility. It will be noted that each improvement has been made with a view of expediting the work and improving it so far as this may be done. In other words, the utilization of better tools or apparatus made it necessary to change the methods the vogue. Now, to take advantage of the increased capacity and superior mobility of the trucks it is imperative to abandon the old systems and adopt what will best serve. So long as there is no disposition to do this there can be no change for the better.

It is not to be assumed that any one system will be satisfactory to all communities and their requirements. It is far more reasonable to believe that those responsible for the administration of municipal departments can determine what will best serve them with the conditions obtaining. But it is a fact that it is far more economical to abandon equipment that may appear to be sufficient for all immediate requirements and adopt facilities that will extend and afford



Belt Driven Pump That Forces the Oil from the Tank Under a Pressure of 100 Pounds to the Square Inch and Affords Equal Distribution.

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Oil Distributor Carried on a Frame Adjustable for Height and Masked to Prevent the Fluid Spraying Beyond a Determined Area.

a far more satisfactory service. As a business proposition it is far better to discard what is known to be insufficient and take up with that which will be better from every view point, although there may be an initial expense of considerable proportions.

To illustrate this in a manner that cannot be misunderstood the experience of the city of Pawtucket, R. I., has a practical value, because it demonstrates the possibilities of the adoption of methods that are reasonably progressive. Pawtucket has a large mileage of macadam and gravel streets, well constructed and well maintained. For years the highways had been watered from early in April to freezing weather in the autumn, with the usual results from such treatments. As the city increased in population the demand for dust suppression at least kept pace with the growth and it will be realized that this could not be and was not denied. As this article deals with the possibilities for improved methods and apparatus it is appropriate that there be some explanation of the changes made that resulted in the utilization of a truck for a work that required 19 watering carts, 19 pairs of horses and 19 drivers.

During the season of 1909 the city suppressed the dust by the use of water, using the equipment stated. The city owned the 19 water tank wagons and during the period of service a pair of horses for each cart and a driver were hired at a cost of $4.50 a day, this bringing the cost for each cart, exclusive of the interest on the investment, depreciation, water charges, insurance, etc., to $27.50 a week, or an aggregate of $522.50. As the city owns its own water works the water was supplied the department at the lowest charge—$60 a million gallons—which is probably a third less than the average price paid by cities. The work was systematically conducted, the city being divided into 19 districts in which one cart was worked each day rain did not fall. These districts were not equal as to size, they ranging from 37,100 square yards to 84,600 square yards of street area, and each driver was expected to so apply the water that the dust would be suppressed uniformly and to make as many applications as was possible. For the purpose of minimizing time in distributing the water standpipes were located as frequently as conditions justified. The expense of the standpipes was not included in the cost of watering.

The entire service was under the supervision of an inspector who was required to visit every section of the city and see to it that the drivers were doing the work required of them and to direct the men in a general way. Of course it was necessary the inspector have a horse and buggy to drive about. Some of the streets were sprinkled more frequently than others, the more generally travelled ways receiving the most attention.

The cost for watering 863,000 square yards of street during the year of 1909 was 1.4 cents a square yard, this including interest at four per cent. on the cost of the carts, water, new apparatus, repairs and supervision, but not the depreciation charge for the apparatus. It might be said that this item was taken care of by the repair account. The cost for the work varied in the different districts from .8 cent to 1.8 cents a square yard, which correctly represents the difference in the service. It might be well to direct attention to this particular condition because, with the use of water, the dust is suppressed only for a comparatively brief time, especially in hot weather, and the more insistent the demand for service there is no possibility of giving more than the normal distribution. In fact it may be said



Manner of Distributing the Oil, It Covering a Section of the Highway Seven Feet in Width.

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The Emerson Dry Street Sweeping Machine, Which Has Been Experimented Extensively in New York, N. Y.

the experience is that when the weather is extremely hot the horses are not able to do as much as they would with a lower temperature.

There is always a considerable difference between the theoretical and the actual work accomplished because of the time lost by the men, and the people are the losers because they do not receive the service they expect. During periods when little rain falls there is greater need of water and that distributed is the more quickly dissipated. Water spread upon the streets has the effect of hastening deterioration, an excess being quite as bad as the lack of it. Under any circumstances the unproductive or empty travel of the watering carts was found to considerably exceed 50 per cent., despite the location of the standpipes.

The department of public works system, taking the maximum work of the carts by district, permitted the watering of from 2.76 to 6.58 miles daily, there being a total of 66.4 miles of highway in the districts served, allowing an average of 22 feet for street width and 13,000 square yards to a street mile. It will be understood that this required from two to four applications.

The use of oil was begun in 1910 and for this service, to cover the same districts, approximately 72 per cent. of the macadam and gravel streets, three watering carts were used. It was found that while the mileage was increased so that each cart served an average of 22 miles this was not satisfactory because of different character of distribution required. To illustrate, the carts were equipped with fan sprinklers from which the oil flowed by gravity. When filled the flow of oil was fairly even, but as the head was diminished the oil was spread to increased depth and over a lessened area, filling the depressions and creating pools from which the oil was thrown by passing vehicles, causing complaint from the owners of conveyances. Not only this the oil was often blown by high winds on to the walks and private property, resulting in extreme dissatisfaction, while it also was carried on the feet of pedestrians into buildings and houses.

So far as suppressing the dust the oil was decidedly superior to water. The oil was received in tank cars and taken by a spur track to the city yard where it was drawn from the tank and spread. The capacity of the tank wagons was 600 gallons each, and a 10,000-gallon tank containing approximately 17 loads could be emptied generally within the time allowed before demurrage was charged—four days. It should be understood that oil cannot be applied when the surface of the ground is wet and occasionally the work of distribution was delayed. It was decided that this was a satisfactory manner of handling the oil, although it would have been practical to have constructed a storage tank of large capacity and stored the oil to be drawn upon as desired. This would have prevented waits for shipments and the payment of demurrage, but the cost would have been considerable.

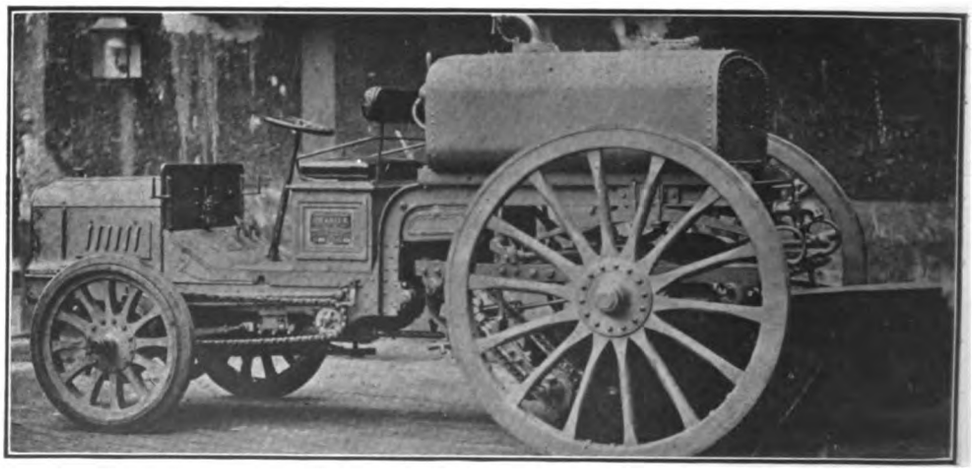
Receiving the oil in this manner developed another condition that was really serious. It was necessary to haul all the oil from the tank car to the different sections of the city where it was used, and careful study proved that fully 80 per cent. of the time of the carts distributing the oil was given over to hauling the oil and returning with the empty tank. In other words, four out of every five days were practically unproductive of labor. This condition could not be changed with the use of the carts and horses. But with this large factor of unproductiveness the cost of the oiling was not greater than of watering.

The experience was that it was best to make frequent applications of oil, the coats to be in the proportion of .1 gallon to the square yard, making at least two distributions and a week or more apart. This work necessitated a greater travel of the carts, while there was the same objection to them because of the uneven character of the distribution.

The city's watering equipment consisted of the 19 tank carts that cost $375 each. The interest on the investment was $270 figured at four per cent. The depreciation was not estimated and was met with a repair expenditure of $1387.90 in 1909. The net cost of the carts was $7125 plus the freight. With the use of water the 19 carts was not sufficient. With the use of oil three carts met all requirements. With the necessity of having a central location from which the oil might be distributed and utilizing the tank cars instead of a storage tank it was considered best to make an entire change of equipment.

When practical experience had demonstrated that oil was desirable from every point of view for the supression of dust the commissioner of public works was authorized to procure such apparatus as would in his judgment afford the greatest economy and efficiency. One purpose was to minimize the unproductive labor and the other was to better distribute the oil, so there would be no waste and eliminate any cause for complaint.

The department prepared plans of an apparatus that



Combination Water Tank and Street Sweeping Motor Driven Apparatus That Has Been Adopted by a Number of European Cities.

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was decided would answer every requirement and found that it was necessary to build it in part. First a three-ton Gramm truck was purchased and from this the body was removed. Then a sheet iron tank of 800 gallons capacity was built to specification and this was installed on the chassis. This size was believed to be best for all-round work and it was proposed to distribute the contents of an 8000-gallon tank in 10 loads. The tank was so constructed that it could be removed from the chassis in a comparatively short time.

Between the forward end of the tank and the driver's cab was located a Deming pump of the three-plunger type and the 16-inch driving pulley was belted to a seven-inch pulley fixed to the clutch shaft, forward of the transmission. The reason for this was that the pump might be driven at all times at engine speed. A standpipe was placed in the tank at the left forward corner with such clearance as to insure practically complete clearance of the tank. The connection with the standpipe and the pump was made so that there need be no pressure whatever in the tank, and the oil be forced by pump to a pressure of 100 pounds to the square inch through a line leading to the spray header suspended by tubes carried in guides at either side of the rear of the tank, these tubes being so constructed that they might be adjusted for height.

The pumpage is controlled by four levers at the left side of the driver. One of these operates a relief valve so as to diminish the flow of oil into the pump. A second permits the bypass of oil so that there may be a diminution of pressure at the header when climbing a hill slowly, for instance, and the engine is running faster than it would normally on a level. The third will shut off the oil supply to header near the pump, and the fourth will shut off the oil supply close to the header so that there will be no flow whatever, as when crossing a walk. It was believed that there might be some difficulty experienced when the speeds of the truck were changed, but it was found that this condition was not realized.

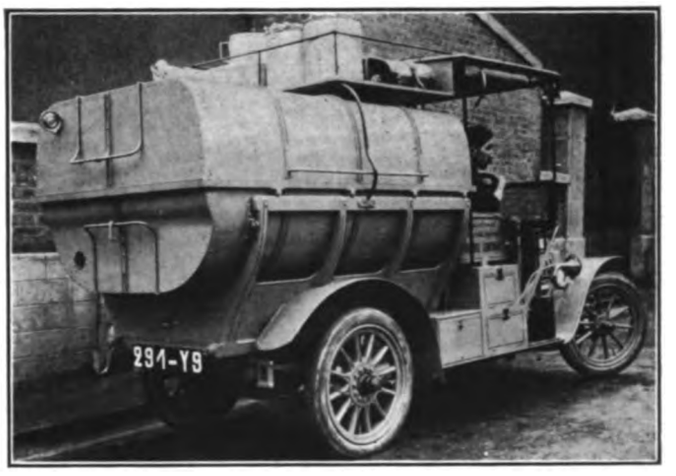
The capacity of the pump was such that a tank of oil could be distributed in about 40 minutes and as the flow was regulated at the header and directed downward onto the surface of the roadway the fluid would penetrate the surface very rapidly. With the tank wagons it was necessary during cold weather to heat the oil to a temperature of 150 degrees at the tank car by a coil of steam pipe to insure penetration, but this was entirely overcome by the use of the pressure distribution. That there might be no oil spray blown about by high winds the header was masked by a canvas covering that is but a few inches above the roadway.

Since the original construction several changes have been made in the apparatus, the pump pulley being reduced from 16 to 12 inches diameter, and the number of outlets increased from 13 to 26, this giving a more equal distribution. It has been found that it is best to change the distributing pressure than to vary the proportions of the outlets. The oil is pumped so long as the truck is moving or the engine is in operation. The control is very precise, as it is possible to oil a road to within an inch or two of a given point, and to begin or cease oiling whenever desired. This evenness of distribution is the same no matter what the quantity of oil in the tank. The tank truck is operated by two men, one driving and the other manipulating the levers by which the distribution of the oil is regulated.

When the truck was first placed in operation it was found necessary to do some experimenting for the crew to become familiar with it, but in a comparatively short time the men mastered it and were able to do exceedingly satisfactory work. In fact, one quality is that within a very few minutes after oil has been applied in light coats one may walk about on the road without any of the discomforts or annoyances that are experienced with other methods of oiling.

The equipment replaced the three watering carts used for oiling and not only does the work, but does it in every way more satisfactorily. It is not possible to keep the machine working all the time for as yet the needs of the city do not require it, but to indicate the capacity it may be said that often a tank car of 8000 gallons is emptied in a day, this meaning that 10 full loads are applied, though occasionally from 10 to 12 hours may be necessary for such work because of the distance of the distribution from the tank car. It is evident that should necessity require the truck could work on a 6000-gallon basis every day that the weather would permit the application of oil.

During 1911 the truck was driven approximately 10,000 miles, the greater part of this in street oiling, and a road area of 835,000 square yards was oiled at a cost of 1.17 cents a square yard, considering oil and labor. With the cost of repairs and supplies the cost was 1.25 cents a square



Truck Adapted for the Collection of Garbage by the Sanitary Departments of Several Cities of France.

yard. The saving shown is .15 cent a square yard, for the theoretical cost of watering was 1.40 cents, but this was somewhat increased because the actual work expected is never what is realized, there being more or less shirking by the men.

Besides the improvement of the distribution there is a distinct saving of 10.71 per cent., and an actual economy of probably 15 per cent., although the full capacity of the machine is not as yet realized. The city distributes between 250,000 and 300,000 gallons of oil annually, this being equivalent to about 350 tank loads, taking 275,000 as the quantity used. Estimating 6000 gallons as a day's distribution and there being 100 days of the year when oiling can be done, this would show an actual work capacity of 600,000 gallons, or more than double what is now required of the truck.

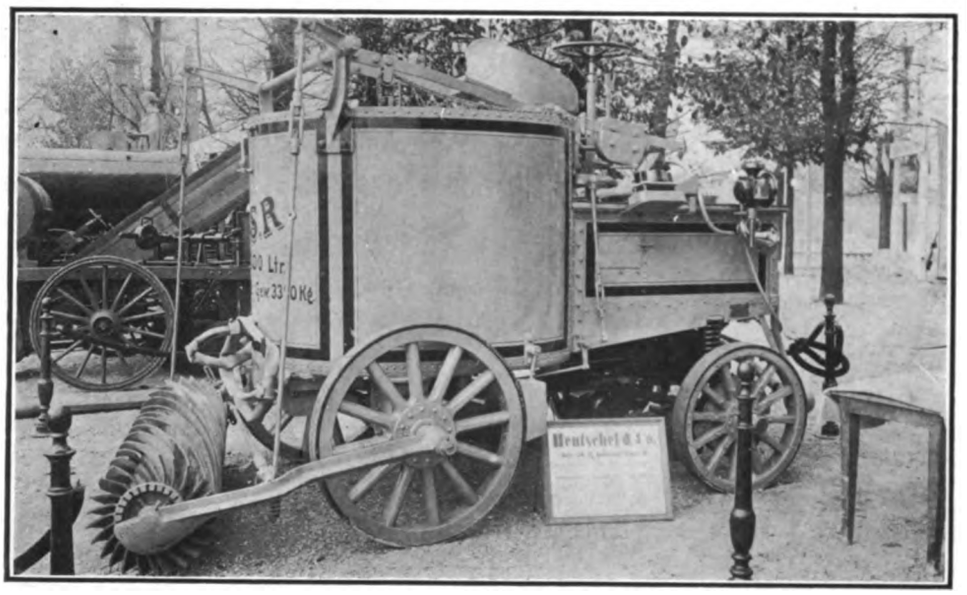
But besides the oiling the truck has proven itself especially serviceable in other ways. When the season closed the pump and tank were removed and the regular body installed and the truck was used by the water department during the entire winter, doing work that required eight hired horses and express wagons. It was loaded each morning with from 15 to 20 laborers and their tools and the men were carried to their work. They were brought back when the job they were on was completed, and not only saved their time, but the expense of the horses and wagons they had previously used. Besides this the truck hauled material and did no end of serviceable work. As a munici-

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pal investment it was a decided success. When the winter's work was finished it was again equipped for street oiling and it is now in this service. It is expected that with the experience of the past year it will show even greater economy.

While this is, so far as is known, the only apparatus of the kind, motor trucks have been adapted to other kinds of municipal work. For instance, the Emerson dry sweeper is being carefully tried in New York City, this being a chassis fitted with a rotary engine driven brush at the back. The sweepings are carried up a chute over the top of the machine and into a compartment, a slight suction preventing the dust from becoming obnoxious.

A street sweeper that has been used with considerable success in a number of cities of continental Europe is a tank and rotary broom carried on two large steel tired wheels. From this tank water is distributed on the paving to lessen the dust and make certain the collection of the refuse. From the side of the street it is collected by wagons. The apparatus is driven by a Richard-Brasier motor and it is interesting in that the drive is by double side chains to the forward wheels, through a cone clutch and countershaft. On the steering knuckles are gear and pinion reductions. The broom drives separately.



Street Sweeper and Water Tank, Driven by a Motor, Very Generally Employed by the Leading Cities of Germany.

Another interesting apparatus utilized extensively in Germany is a motor driven tank carried on four steel shod wheels and carrying a rotary broom. This also sweeps the refuse into the side of the street for collection.

In France a motor truck is utilized by the sanitary department for the collection of garbage. The body is of metal, completely closed, and mounted on rollers on the deck of the chassis so that it may be withdrawn for dumping. The purpose is to facilitate the carriage of the garbage and to minimize the odor, while with the removal of the body the truck may be used for other work.

These are some of the practical uses for trucks in municipal service. They emphasize that with changed methods there is the best of reason for utilizing the superior qualities of these machines.

The Lippard-Stewart Motor Car Company, Buffalo, N. Y., maker of Lippard-Stewart trucks, has appointed the following agencies to handle its product: Whitney-Barney Company, Boston, for Massachusetts, New Hampshire and Vermont, and Taylor Motor Car Company, Pittsburg, Penn.

NEW CONTINENTAL MOTOR WAGON.

E. M. Anderson and Dr. J. G. Barnsdale of Superior, Wis., have incorporated the Continental Truck Manufacturing Company of that city, which has entered the commercial vehicle field with a Continental wagon of one to three tons capacity. Only one type of chassis will be constructed at present, to which will be fitted three standard bodies, one an open express, one a closed panel and the third a stake platform.

Perhaps the most conspicuous feature of the car is the extreme accessibility of the motor, which is a four-cylinder unit with bore of 4.125 inches and stroke of 5.25, located in front under the footboard. When this latter is removed the whole top and forward end of the engine are easily reached by the operator from the front between the wheels. The carburetor, magneto, force feed lubricator, pump, valve mechanism and piping are all exposed to view and readily accessible for work.

The motor is rated at 35 horsepower. The magneto is mounted on side of the crankcase. Cooling water is circulated by a gear pump through a radiator which forms a part of the dash and is out of the way of both accident and injury. An automatic governor is fitted so operator is effectually prevented from exceeding a predetermined speed.

The clutch is a cone member. The transmission affords four speeds, and the jackshaft carries the differential and sprockets, final drive being by chain. The frame is steel, double trussed, and is mounted on semi-elliptic springs in front and full platform members in the rear. These latter are not required to take the drive thrust, substantial radius rods being provided for this purpose. Brakes are internal expanding and external contracting.

Both axles are drop forgings of nickel steel, hammered into shape and then special heat treated without welds. The front member is of the I beam type three inches wide, while the rear is of solid steel, three by 3.25 inches. Wheels are larger in the rear than in front, the former being equipped with 40 by four-inch solid tires and the latter with 36 by 3.5 inches. The wheelbase is 120 inches and the tread 56.

DIAGONAL BLOCK TIRE.

The Diagonal Block Tire Company of Urbana, O., is producing a new tire, the Diagonal Block. As the name implies this tire is constructed on the block principle, each section or block being removable independently of the others. The outstanding feature is the shape of the section, which is rhomboid, so that it extends diagonally across the tire. This feature is claimed to give greater traction and at the same time the smooth running of the continuous tire. A booklet describing the product will be mailed on request.

The Luverne Automobile Manufacturing Company of Luverne, Neb., is to place shortly on the market a one-ton delivery car. The company has heretofore confined itself to pleasure car production.

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NEWS OF THE COMMERCIAL VEHICLE INDUSTRY.

Buffalo's Electric Concern Makes Known Its Official Board—Several Trucks Ready for Their Initial Appearance—Other Interesting Items.

Announcement was made in these columns last month of the incorporation of the Buffalo Electric Vehicle Company, Buffalo, N. Y., with a capital of $1,000,000. At that time little was known about the concern, other than that it was to be a merger of five companies in that city for the manufacture of electric vehicles of all types. The personnel of the organization was made public in the election of officers April 22, and it is assured that the enterprise will not lack substantial and influential backing.

The officers are as follows: President, Samuel J. Dark, secretary of the Buffalo Dredging Company, secretary of the German-Bock Asphalt Company and director in the Commonwealth Trust Company; first vice president, A. A. Landon, president of the Clark Motor Company and superintendent of manufacture with the American Radiator Company; second vice president, W. A. Morgan, president of the Buffalo Taxi Company, director in the Buffalo Copper & Brass Rolling Mill and district manager for Swift & Co.; treasurer, Harry Yates, first vice president of the Union Furnace Company, treasurer of the Lafayette Hotel Company and vice president of the Commonwealth Trust Company; secretary, Alfred W. Thorn, president of the Thorn Cement Company and director in the Commonwealth Trust Company.

The directors are: President Dark, Vice Presidents Landon and Morgan, J. T. Steele and John W. Van Allen. Director Steele is an investment broker and Van Allen a prominent Buffalo attorney.

CHASE COMPANY DOUBLES CAPITAL.

The increasing demand for Chase trucks, made by the Chase Motor Truck Company, Syracuse, N. Y., has resulted not only in the decision to erect additional factory facilities, but at the last meeting of the stockholders the capital was increased from $150,000 to $300,000. The company reports good business conditions throughout the Middle West and Northwest, where the demand for its product has been increasing constantly since the first of the year.

DRIGGS-SEABURY TRUCKS COMING.

The Driggs-Seabury Ordnance Works, Sharon, Penn., has been engaged upon the construction of 20 motor trucks, which will soon be given their preliminary tests. It is understood that the concern contemplates entering the commercial vehicle field, building mechanical transports on a large scale. These models will be produced in capacities of three, four and seven tons, respectively.

ATLANTIC ELECTRIC TRUCK.

The list of electric commercial vehicles in the market is to be augmented in the near future by the addition of the Atlantic, to be made by the Atlantic Vehicle Company, North Newark, N. J. The line will include cars of one, two, 3.5 and five tons capacity. The designer is Arthur J. Slade, who has been connected with the production of electric automobiles for a number of years, in co-operation with others who are extremely well versed with the needs of the mechanical transport.

The officers of the company are: President, McKinley Boyle, until recently with the Continental Car Company of Louisville, Ky.; vice president and sales manager, Ralph Sanger, formerly with the machinery firm of Wanham, Sanger & Bates. Mr. Slade is chief engineer, although he will continue his private practise as a consulting engineer.

INTERESTED IN HART-KRAFT FACTORY.

According to a dispatch from York, Penn., a $200,000 corporation is in the process of formation for the purpose of taking over the factory of the Hart-Kraft Motor Company of that city. It is understood that the promoters have associated with them a practical man from the Mercedes factory in Germany; and that immediate steps will be taken to enlarge the present plant.

G. M. C. PAYS DIVIDEND.

The General Motors Company, of which the General Motors Truck Company, maker of G. M. C. gasoline and electric trucks, is a constituent, has declared a dividend of 4.5 per cent. on its preferred stock to stockholders of record April 15. The full dividend rate on this stock is seven per cent. a year, and the odd amount of the present payment is accounted for in the fact that the dividend date was pushed forward one month, because of interest payments which fell due April 1.

DIXON COMPANY'S ANNUAL MEETING.

At the recent annual meeting of the Joseph Dixon Crucible Company, Jersey City, N. J., maker of Dixon's graphite lubricants, 9304 shares of a total of 10,000 were represented, and the following officers and directors were re-elected: President, George T. Smith; vice president, W. H. Corbin; secretary, Harry Dailey; treasurer; George E. Long; assistant secretary and treasurer, J. H. Schermerhorn; directors, George T. Smith, William Murray, Edward L. Young, William H. Corbin, William G. Bumstead and Harry Dailey.

KELLY-RACINE TIRE DEMAND.

The Kelly-Racine Rubber Company, Racine, Wis., has increased its capital by $150,000. This move was made necessary by the volume of orders on hand, which could not be filled with the present facilities. The new capital will be used to enlarge the factory, so that the annual output, which has grown to $1,200,000 in the two years that the company has been manufacturing, will be considerably increased. George B. Wilson was recently elected president and general manager.

WOULD REORGANIZE COMMER INTERESTS.

A committee has been appointed by the creditors of Wyckoff, Church & Partridge, Inc., New York City, maker of Commer trucks in America under license from the English concern, looking toward a reorganization of the company. This committee consists of the following: H. M. Swetland, chairman; Chester Griswold, secretary; R. D. Moore, president of the Commercial Trust Company; A. Hauschild of the Polack Tyre Company; A. G. Bruckman, president of the Livingston Radiator Company, and A. B. Ralston, attorney.

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LAMBERT TRACTORS IN LOS ANGELES.

Following the announcement that the Ford Motor Company of Detroit, maker of Ford pleasure and commercial lines, would erect a branch factory on the Pacific Coast, comes the information that the Buckeye Manufacturing Company of Anderson, Ind., will locate a plant in Los Angeles for the manufacture of Lambert farm tractors. It will be remembered that this latter concern has been engaged in the production of Lambert friction driven pleasure cars for several years, and recently began the manufacture of Lambert trucks, as well. The Lambert tractor is an entirely new proposition, although it has been experimented for some time at the Anderson factory. It is designed especially for use in orchards and in field work upon the farm.

It is understood that the Pacific Coast branch will be conducted as an entirely separate institution and that no pleasure cars or trucks will be constructed, at least for the present. J. W. Lambert, treasurer and general manager of the company, has been spending considerable time in the vicinity of Los Angeles, studying the market and the situation.

The Lambert tractor is a three-wheeled vehicle, the single wheel being located in front. The driver occupies an iron seat of the skeleton type placed at the extreme rear, steering being accomplished by an ordinary automobile hand wheel immediately in front of the operator. The column extends to a point near the centre of the vehicle and thence by the usual arrangement to the front wheel. The motor is located over the rear wheels, and the patented Lambert friction transmission is in front, and placed in a position exactly the reverse of that in the Lambert pleasure cars. It will be seen that the motor drives forward to the discs, which in turn drive backward to the traction wheels.

The rim of the front wheel is a broad band of steel with rubber in the centre, so designed that the rubber is utilized for travel over hard surfaces, and the steel comes into play the moment the wheel sinks in soft ground. The rear members also are shod with rubber, but in addition metal cleats are fitted for additional tractive effort when needed. The motor is rated at 40 horsepower, and is of the four-cylinder, four-cycle type. The entire design has been with a view of providing for an extremely low centre of gravity and the machine has been kept down to a height of 42 inches.

MONITOR SALES FORCE IN CHICAGO.

The general sales and publicity departments of the Monitor Automobile Works, Janesville, Wis., maker of Monitor commercial vehicles, have been removed from that city to Chicago, where headquarters have been established at 1421 Michigan avenue. J. E. Nordling, secretary and treasurer of the company, is in charge of the Chicago office, with F. W. Stewart acting as sales manager. President Westerlund remains in charge at the factory in Janesville.

CHANGES IN GOODYEAR FORCES.

The following changes have been made in the personnel of the selling force of the Goodyear Tire & Rubber Company, Akron, O., maker of Goodyear tires: George Bullock and Willard E. Parsons, San Francisco branch; G. R. Kreps and Frank R. Isaac, motor truck salesmen, Philadelphia; M. J. Dobler, city salesman, New York City; Woodson Reese, covering Missouri from Kansas City; H. B. Annable, Spokane, Wash.; H. C. Falkell, Cincinnati; C. G. Woodward, motor truck salesman, Memphis, Tenn.; F. B. Sullivan and Myron T. Sparks, motor truck salesmen, Boston, Mass.; E. C. Hied, Baltimore, Md.; Robert E. Campbell, St. Louis; E. F. Crawley, Jacksonville, Fla.; V. D. Lersch, Buffalo, N. Y.; J. H. Whetstone, Detroit; Glen Schrader, Dayton, O.; J. J. Kendall, Charlotte, N. C.; H. Q. Tenant, inspector adjusting department, Atlanta, Ga.; W. E. Dermody, New Orleans; G. T. Hancock, Newark, N. J.

NEW VICTOR OFFICERS.

At a recent special meeting of the Victor Motor Truck Company, Buffalo, N. Y., maker of Victor commercial vehicles and fire apparatus, Orson E. Yeager, president of the Buffalo Chamber of Commerce, was elected president of the concern. John A. Murphy was chosen vice president. H. B. Millard of Brooklyn, N. Y., was added to the directorate, with the two new officers.

F-S LIGHT DELIVERY CAR.

The F-S Motors Company has been organized in Milwaukee, Wis., for the purpose of producing a new light delivery car to be known as the F-S. It is understood that this is practically a constituent of the Filer & Stowell Company of that city, which already has a controlling interest in the Beaver Motor Company, the Petrel Motor Car Company and other important concerns in that vicinity.

DAY COMPANY LEASES FACTORY.

The Day Automobile Company, Detroit, maker of the Day Utility car, a convertible vehicle, has leased for five years the factory building recently erected at 25 East Milwaukee avenue in that city. It is of two stories, constructed of brick and will afford 20,000 square feet of floor space.

GENEVA WAGON ENTERS FIELD.

A concern which has held an enviable position in the horse vehicle industry for many years, but has now decided to enter the motor truck field, is the Geneva Wagon Company, Geneva, N. Y. Its product is to be known as the Geneva motor wagon, and while but one chassis will be provided, at least two standard types of body will be fitted. With the open body the capacity is rated at 2100 pounds and with the full panel type, 2300. The motor is a two-cylinder opposed unit, water-cooled, located under a short hood in front of the dash. The horsepower rating is 20, with a bore of 5.125 inches and a stroke of 4.5.

UNDERTAKERS PREFER MOTORS.

A situation which will prove of interest to those engaged in the manufacture of automobiles is disclosed in the action of the Hearse Builders' Association of America, at its recent annual meeting in Columbus, O. It developed that there was an increasing demand for the undertakers' wagons and hearses equipped with motors instead of being adapted for horses. The sentiment was so strong as to call for an expression of opinion among the members of the association.

TO MAKE KREBS TRUCK.

A new concern has been organized in Clyde, O., to be known as the Krebs Motor Truck Company, for the manufacture of Krebs commercial vehicles of 1500 pounds capacity. It is understood the motor will be a two-cylinder, two-cycle unit with bore of 4.5 inches and stroke of 5.5.

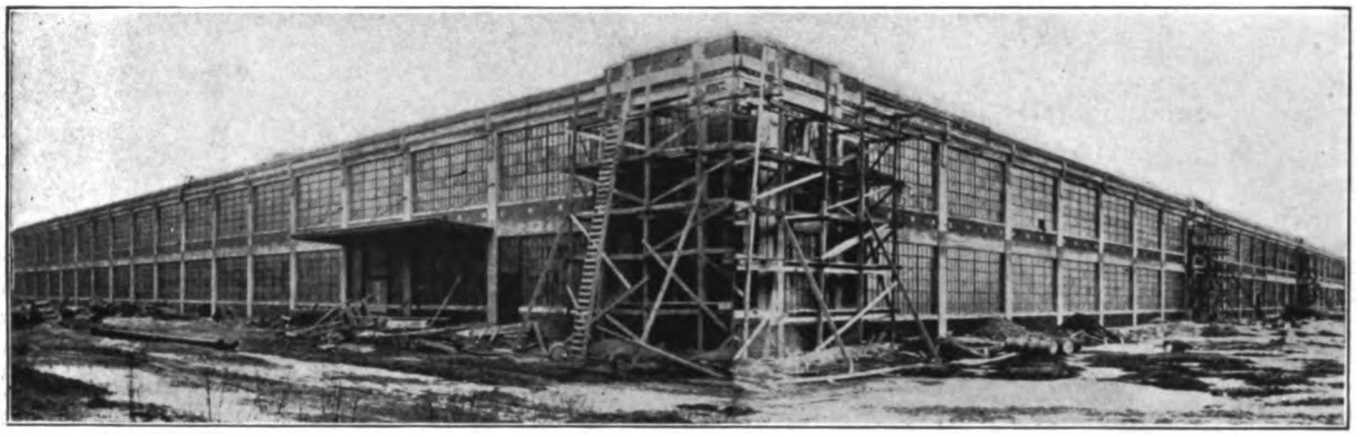
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CONTINENTAL MOTOR'S NEW FACTORY.

What is claimed to be the largest factory building in the world devoted to the construction of motors for pleasure and commercial cars, has been erected by the Continental Motor Manufacturing Company, Detroit, on Jefferson avenue, near the plant of the Hudson Motor Car Company in that city. An accompanying illustration shows the outer shell of the building, as it was nearing completion and gives some idea of its extent. The cost of the structure was approximately $1,000,000, and it is expected to more than double the capacity of the company, which was held to be about 18,000 Continental motors annually.

In style and construction, the new building is similar to those of the Hudson company. Structural steel, reinforced concrete and steel window sashes make the factory as nearly fire proof as modern methods of construction will permit. To still further protect the property against danger from fire, an automatic sprinkler system has been installed throughout.

The total floor space is 240,000 square feet, the factory covering 12 acres of the plot of 30 which the company purchased recently. The main portion is two stories high and over 500 feet long, and was planned with the idea of securing plenty of light and air on all sides. The interior is fitted in the very best modern manner, and all machinery employed will be strictly up-to-date.



The Outer Shell of the Continental Motor Manufacturing Company's Plant in Detroit, Said to Be the Largest Institution of Its Kind in the World.

It is not the intention of the company to abandon its present plant at Muskegon, Mich., but the well known truck and pleasure car engines will be produced in both places. Quality will continue to be the governing policy of the concern, and it is anticipated that the Continental motor will continue to be the foundation stone upon which the success of many motor car and motor truck manufacturers are built.

WENONAH TRUCK FROM MICHIGAN.

A. B. Perkins, his three sons, and G. E. Porter have organized the Wenonah Motor Truck Company, which will be incorporated at Bay City, Mich. Vehicles of 1000 and 1500 pounds capacity will be constructed.

OREGON PRODUCT APPEARS.

The first vehicle produced by the Ewbank Power-Transmission & Motor Company, Portland, Ore., has made its appearance in the market, and plans are under way for the erection of a large factory in which trucks, fire apparatus and motor propelled railway equipment will be constructed. The basis of the new product is a gasoline-electric traction system designed by H. B. Ewbank, Jr., which involves the use of separate driving motors for each rear wheel, speed control being accomplished through the regulation of the engine. The officers of the company, which was organized in December, are: President, S. M. Mears; vice president, George W. Stapleton; treasurer, R. S. Howard; secretary, Dr. H. B. Ewbank; chief engineer, E. H. Ewbank, Jr.

MONEY FOR THREE-WHEELED VEHICLE.

The Wagenhals Motor Car Company, which has been engaged in exploiting a three-wheel light delivery car of that name, has secured sufficient capital in Detroit to warrant making plans for procuring a factory site. It is understood that production on a large scale will begin in the near future.

TRUCK FACTORY IN DAVENPORT.

According to a dispatch from Davenport, Ia., the business heretofore conducted under the name of the East Davenport Machine Shop is to be reorganized as a motor truck manufacturing concern. Two trial vehicles are now being constructed for local firms, and it is anticipated that these will prove sufficiently successful to warrant the production of vehicles of any size and model desired.

LANSDEN SECURES NEW FACTORY.

The Lansden Company, Newark, N. J., maker of Lansden electric trucks, of which Robert Schuttler Hotz of Chicago recently became president, has removed to a new plant which has been completed for it in that city. The building is 80 by 300 feet, and is expected to have a capacity of 1500 commercial vehicles a year.

LAUTH-JUERGENS COMPANY EXPANDS.

Plans are being prepared by the Allyn Engineering Company of Cincinnati, O., for a one-story brick and steel addition to the plant of the Lauth-Juergens Motor Car Company, Fremont, O., maker of Lauth-Juergens trucks. The building will be 60 by 200 feet and will provide ample accommodations for the present needs of the rapidly growing business of the concern.

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EFFICIENCY IN WHOLESALE GROCERY SERVICE.

An Interesting Example of What May Be Accomplished with Mechanical Transport in Coping with a Situation in Which Horse Drawn Equipment Cannot Be Utilized Either with Profit or in a Practical Manner.

By C. A. French.

EFFICIENCY may be incapable of being reduced to dollars and cents, at least to the extent of placing the finger upon any one item and declaring beyond dispute that it has cost so much money to gain a certain result which is worth so much more money. Undoubtedly it would be possible to arrive at a decision as to whether one method of doing work were more economical than another, if the conditions under which this work were performed were exactly, or even approximately the same. In many lines of business it has been found that a motor truck, for instance, which it is best adapted is not sufficient to keep it busy all the time. In such cases it is necessary to provide additional employment, which might or might not be undertaken quite as advantageously by horses under ordinary circumstances. By this is meant that while the truck would not necessarily show an economy in the work at which it was placed in order to make use of what might be termed its spare time, its efficiency in the class of service for which it was best adapted would more than offset the difference, and whether or not it effected economy all of the time would prove im-



Allen Slade & Co.'s Knox Truck Starting Out from Fall River for New Bedford, After Its Plunge Through an Open Culvert.

could be utilized in hauling under identical conditions in which horses had been employed formerly or were still employed. Under such circumstances it should prove an easy matter to secure comparative costs, and wherever such have been obtained, the mechanical transport has given abundant indication of economy.

Until recently, many business men have been inclined to look upon the matter of economy with too little thought concerning efficiency. If a given truck can do a given work in less time than it would take a horse drawn vehicle to accomplish the same results, that is efficiency. It will indicate that if there be sufficient work to keep the truck busy it will replace a certain number of horses, and upon the number of horses it replaces depends the item of economy. It is not enough to show that a truck can do the work of sufficient horses to effect a definite saving. The two items of efficiency and economy can be combined only when the truck actually is doing the work of the horses it can replace.

But the haulage problem is by no means so easy of solution. There are times when it is possible to utilize a truck to advantage even when the work does not permit of its maximum efficiency. That is to say, the kind of work for material in considering this phase of the situation.

It may even be impossible to show definite economy in the work for which it has proved most efficient, for the reason that many commercial vehicles are being utilized in work for which it would be impractical to employ horses. In order to determine whether or not such utilization were economical it would be necessary to take into consideration other features of the business than the haulage problem. For instance, if it could be stated definitely that a certain amount of business was secured and retained through the use of a mechanical transport, the economy would depend upon the proportion of such business and the total cost of obtaining and holding it. Since other items enter into the consideration, and the nature of these is such as to vary with the individual concerns, it is a difficult matter to trace economy under such circumstances.

However, it will prove of interest to study an instance of this nature, reference being had to Allen Slade & Co., Fall River, Mass., a wholesale grocer employing 14 horses and two motor trucks. One of these latter is a two-ton Knox, made by the Knox Automobile Company, Springfield, Mass., which has been in service with this concern since July, 1909.

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Allen Slade & Co., has its main offices in Fall River, with a branch establishment in New Bedford, 14 miles distant. The wharf is at Fall River, about a mile from the main store. Teams are employed in hauling goods from the wharf to the store, and in making deliveries to retail dealers in Fall River and vicinity. Other teams perform similar delivery service in New Bedford. The Knox truck is employed chiefly in transporting goods from Fall River to New Bedford, where it either delivers them to the branch house or to retail dealers as occasion demands. When not thus utilized, it makes deliveries in Fall River and brings goods from the wharf.

It readily will be seen that if it were employed continuously in one line of work or the other, it would be possible to compare its service with that of horse drawn equipment. Under the circumstances, however, this is entirely out of the question, and to quote the transportation manager, William Buffington: "It does not interest us particularly what this truck costs, since it does work it would be impossible to undertake with horses."

To explain this statement, it is necessary to offer a comparison. An attempt was made to serve the New Bedford route with a four-horse team. In order to make the trip at all, it was found necessary to load the wagon and start from Fall River at 9 in the morning. This outfit delivered the goods at the New Bedford branch and returned to Fall River at 7 in the evening. With the truck it is possible to begin loading at 11 in the morning, visit New Bedford and return at 3:30 in the afternoon.

When Mr. Buffington uses the word "impossible" it is obvious that he means something more than this explanation would indicate. It must be remembered that a stock of goods is kept on hand at the New Bedford branch, and when it is necessary for the truck to make delivery thereto, it is because something is needed. There was a time when a retail dealer was forced to give an order for goods and wait until the steam railroad could deliver the freight. Nowadays, no such delay is tolerated. The wholesaler who cannot deliver the goods when wanted must give way to the concern which can and will. As a result, the retailer orders when he needs the goods, and he expects delivery as soon thereafter as modern methods will permit.

Therefore, when the retail dealer goes over his stock in the morning and finds he must have certain goods, he calls up the wholesale house by telephone. The firm which can fill this order in time for the afternoon delivery from the retail store, gets and retains his business, other things being equal. If the retailer is forced to wait until late in the afternoon for his goods, it may mean the possible disappointment of one of his best customers, and he will no more wait for horse delivery than he will depend upon the railroad, when either or both can be avoided.

But even if it were "possible" to utilize horses to advantage, it would still be impractical, for the reason that it would not be possible to do the work with four horses. By this is meant it would require the maintenance of reserve animals in order to continue such deliveries. Allen Slade & Co., keeps a reserve of three or four horses, in order to have the actual services of 10 or 11. This is practically a percentage of from 30 to 40, which is by no means excessive, when it is known that some concerns operating in the larger cities carry a reserve as high as 70 per cent. It would not be difficult to show an economy in the use of the Knox truck if its work were confined to the New Bedford delivery.

There is still another way of looking at the matter. If it were not for the fact that it is possible to make quick delivery over the road with the Knox, it would be necessary to carry a very much larger stock at the New Bedford branch, which not only would mean a greater amount of capital tied up in goods which might not be needed, but would necessitate the employment of additional horses in that city. At present there are three teams engaged in handling the deliveries from the New Bedford branch to dealers, and the Knox helps reduce their work by making some deliveries direct. Mr. Buffington estimates it would take at least five teams, were it not possible to utilize the truck in this manner.

The New Bedford trips are not made daily, and it will be seen that the truck is not employed all day long when trips are made. It makes deliveries around Fall River, and hauls freight from the wharf. Something must be said concerning this latter work. Here the truck can and does make 20 trips a day between the wharf and the store. The horse wagons make five on an average, and six in an emergency. It depends somewhat upon the nature of the freight. Mr. Buffington says that in carrying barrel sugar the Knox will replace four two-horse teams, with bag sugar three, and with canned goods two. If some satisfactory method of quick loading and unloading could be devised, he thinks he could safely count on doing the work of four two-horse teams right along. It is significant that no more horses are being bought by Allen Slade & Co., and that when new equipment is needed, motor trucks will be purchased.



Knox Owned by Allen Slade & Co., on Parade, Loaded with Two Tons of Coffee.

Concerning the truck itself: It was designed and delivered as a two-ton vehicle. After it had been in service a few months, the company found that two tons was not all the freight it desired to transport with it, and it was decided to have the rear axle replaced by three-ton construction. Mr. Buffington says that it has carried three tons on a few occasions only, and that for the most part it has been hauling loads averaging 2.5 tons. The present construction is held to be ample for this work, with plenty of reserve for an emergency.

Most of repairs have been such as applied to what might be termed the wagon portion of the truck. Very little has

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been expended on the motor and transmission. Four new springs have been purchased and new brake shoes have been secured. The vehicle was completely overhauled at the factory of the Knox Automobile Company in the spring of 1910. It was not given a thorough overhaul at any one time in 1911, although pretty nearly the whole machine was gone over by the driver at one time or another. A few weeks ago, during a heavy rain storm, on a return trip from New Bedford, it went through a culvert which had been washed away. When a relief driver was sent out to bring it home, only the rear wheels were visible above the road surface. This gave abundant opportunity for a thorough overhaul, and as may well be imagined several parts had to be replaced with new ones. This hardly can be considered as the fault of the truck, and it must be added that the work of repairs was made in this instance, as has always been true of any necessary adjustments or replacements since it was purchased, under the shed at the store near the loading platform.

The company maintains a small repair shop in the rear of the store. Here the operator does what work is necessary, and such machine work as he requires is done under his supervision at one of the nearby shops. The truck is garaged under the shed, and although this has been an exceedingly hard winter, there never has been any trouble about starting in the morning. Mr. Buffington says the car is in as good condition today as when it left the factory, and better, as far as the work for which it is required is concerned. An accompanying illustration shows it loaded ready for the New Bedford trip. This was taken one day this last month, and shows the machine after its experience in dropping through the open culvert.

Tires have offered a greater problem than any other part of the vehicle. Still, this item does not appear to have proven at all unsatisfactory. Hartford solid tires were employed until very recently, and the present equipment is the new United States demountable. All tires have been furnished on a guarantee of 8000 miles, and twice this mileage was obtained on the front wheels. The average for the rear wheels has been from 5000 to 6000 miles. The tire maker always has made satisfactory adjustment, and the tire expense figures out at 3.5 cents a mile for the two years and nine months. Fall River has the reputation among tire salesmen of being exceptionally hard on wheel equipment, much of the pavement being Belgian block. The experience of Allen Slade & Co. appears to have been quite satisfactory for all concerned.

In the matter of gasoline, no exact record has been kept, except at rare intervals, and then only for a week at a time. It is estimated that the truck travels an average of 30 miles a day. It will be seen that the New Bedford trip would make at least 28, not counting any deliveries which may be made to retail stores there. Twenty round trips from the wharf to the store would give 40. Thirty miles appears to be a conservative estimate. Such records as have been kept indicate a mileage of about seven to the gallon.

The operator is particular about the oiling system. Once in two or three weeks he draws off all the oil and puts in a new supply. This old lubricant is thrown away, although it might be considered possible to strain it and use it again. It is believed that a safe estimate of the oil used is an average of a pint a day.

Mr. Buffington has a somewhat unusual method of figuring depreciation. At the end of the first year he wrote off $1800. The truck cost $3800. He says he can maintain the vehicle at the remaining $2000. If he were to consider depreciation he would figure 10 per cent. after that first year. He prefers to figure repairs in lieu of depreciation and expend such a portion of the $200, which would be 10 per cent. on $2000, in bringing the car to that figure. He has no means of knowing whether he expends the whole $200, although of course he expects the repair bill to exceed that figure this year on account of the accident. Included in the repair and overhaul expense is an annual item of $35 for painting.

Taking these figures as a basis, it will be possible to obtain a satisfactory estimate of what the truck has cost Allen Slade & Co., during two years and nine months. Granting that the average daily mileage was 30, counting 300 working days in a year, the total distance covered has been 24,500. At seven miles to the gallon for gasoline, this would give 350 gallons. A pint of oil a day for 825 working days is 106 gallons. Depreciation is figured Mr. Buffington's way, and interest is based on the original cost of the truck. The table follows:

Gasoline @ 11 cents a gallon	$ 385.00
Oil @ 50 cents a gallon	53.00
Tires @ 3.5 cents a mile	857.50
Depreciation, first year	1800.00
Repairs in lieu of depreciation	350.00
Interest, 6% on $3800	627.00
Total	4072.50

This gives an annual expense of about $1480. It should not be understood that this is anything other than an estimate, based upon the figures as given by Mr. Buffington. While Allen Slade & Co. does not keep an exact record of its horse costs, it is claimed by others in Fall River that it costs about $5 a week to utilize horses. Evidently, this does not include depreciation or the expense of maintaining wagons and harnesses. In other cities, the size of Fall River, the cost of horse drawn equipment figures out at between $500 and $600 a year. The number of animals this Knox truck could replace at various lines of work is indicated herein. Those who desire may make their own estimate as to the economy effected.

As was stated earlier in this discussion, the principal point at issue is the matter of efficiency. In this respect, there is much to be said for this Knox truck. Leaving out of consideration the 10 days necessary to put it in condition after the accident in the culvert, it has lost two days' time since Jan. 1. This is about the average maintained for the year, 1911. In 1910 it was out of service for some time while at the Knox factory for an overhaul, and its greatest loss in this respect was occasioned during the first year of its life. Mr. Buffington holds that the first year is the worst of the lot. After the truck has had opportunity to accustom itself to the work expected of it, he believes there is less liability of damage and less necessity for lost time.

TIME AN IMPORTANT FACTOR.

The Peerless Motor Car Company, of Cleveland, O., maker of Peerless pleasure and commercial lines, is calling attention to the fact that to realize the full efficiency of the motor truck, loading time should be reduced to a minimum. This is seemingly a simple proposition, but too often neglected, many a driver running his vehicle at break-neck speed to the depot or factory, only to waste valuable minutes in loading or unloading when he arrives there. The efficiency of many a truck will be much raised if attention is given to the methods of loading and unloading with the idea of keeping the car moving as much as possible.

FIRE WAGON FOR BEVERLY.

Beverly, Mass., is planning to follow the lead of Salem, which recently purchased a motor chemical wagon for $5800. Chief Arnold of the Beverly fire department, has inspected the Salem apparatus, and is much pleased with the machine, which has a speed of 60 miles an hour and carries large chemical tanks and considerable equipment.

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COMBINATION PASSENGER AND FREIGHT BODY.

BODY design and construction is only just beginning to receive the attention from motor truck manufacturers which the importance of the subject demands. Many of these concerns will continue to devote their efforts to the production of chassis which shall meet the requirements of the severe uses to which they will be put, leaving this matter of body design to others, who have been devoting their fore the mechanical conveyance came into vogue. This apfore the mechanical conveyance came into vogue. This applies to all types of vehicles.

Presented herewith is a combination freight and passenger body designed and constructed by the Motor Truck Body Company, Detroit, a concern which is eminently well fitted to take up this problem, its members having had extensive experience covering several years. The body is of sufficiently heavy construction to permit of carrying a three-ton freight load, should the purchaser desire to remove the seats disposed behind the driver and utilize it for that purpose. As shown it will accommodate 32 passengers in a convenient and comfortable manner.

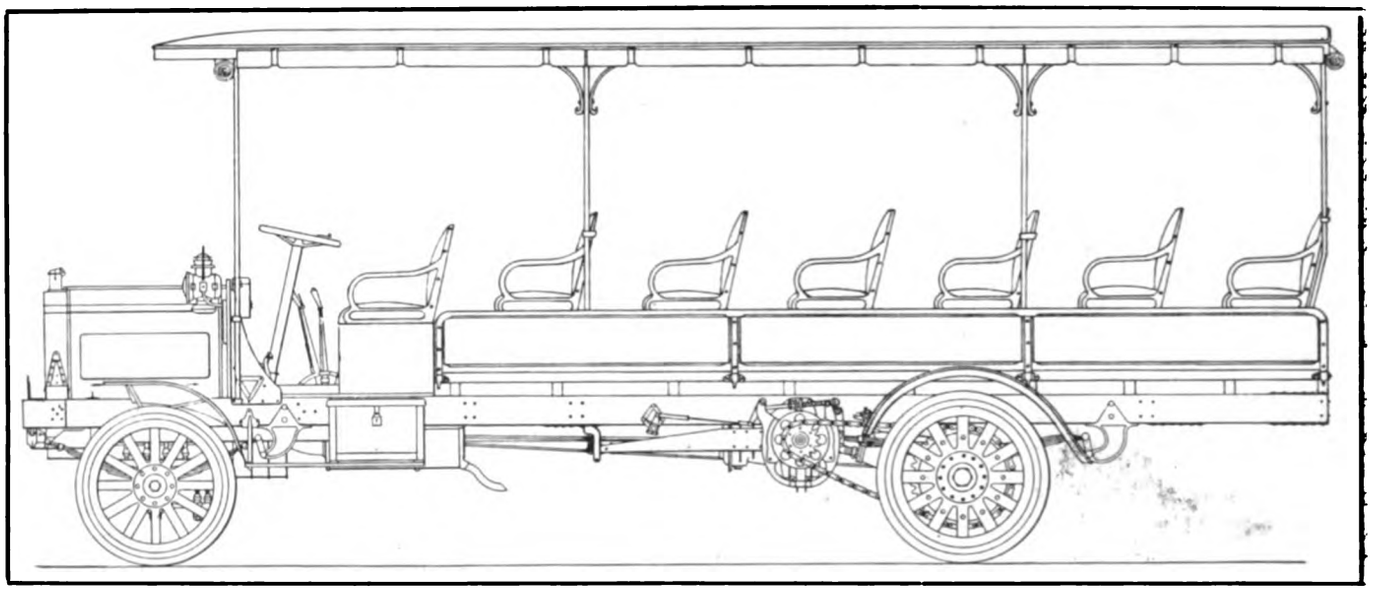
The boards along the sides are folded up for the convenient loading of passengers, and when in an upright position they make a very good signboard for sight seeing advertising. In addition to these the hinged tail gate is particularly advantageous for the easy loading of freight from the rear and holding it in place when loaded.

To return to the seats. These are of the same order as those employed with the standard street car construction, with regular spring cushions and padded back, making for decided comfort. The front seat is hinged, giving the driver easy access to the gasoline tank.

The top is of light slat and canvas construction, supported by steel standards with suitable bracing, which fit into sockets on the floor, making for easy removal. Curtains are furnished to enclose the body completely, a special feature which will be more apparent in stormy weather. Celluloid lights of sufficient size to light the interior are provided in each.

The particular advantage of this assembly and one which is expected to make its appeal to those engaged in catering to summer visitors, is found in the fact that it can be converted at once from a passenger or sight seeing 'bus into a freight carrier. Thus, it will be seen that it might be utilized in the morning for conveying the guests to the hotel, and on the next trip to bring their baggage, while in the afternoon it could be employed in taking tourists to points of interest. After the vacation season is over, it can be transformed permanently into a general utility truck for all sorts of light and heavy work.

It hardly need be mentioned that the appointments throughout are of the very best material. Nothing in the way of appearance has been sacrificed to meet the demands of utility. The company has found this type of body to be greatly in demand, not alone because of its exceptional adaptability but because of its value as a means of drawing patronage through its excellent provisions for comfort and attractiveness.



Combined Passenger and Freight Body Designed to Seat 32 Persons and Constructed by the Motor Truck Body Company, Detroit.

NEW McINTYRE AGENCIES.

The W. H. McIntyre Company of Auburn, Ind., has closed a number of agency contracts since the first of the year. This make of truck will be well represented in all parts of the country, as may be seen by the list which follows:

McIntyre Commercial Car Company, Hartford, Conn.; Mechaley Auto Company, Stamford, Conn.; Shinkle, Richardson & Co., Huntington, Ind.; Fox Bros., LaCrosse, Wis.; McIntyre Auto Sales Company, Webster, N. Y.; Imperial Motor Car Company, Nashville, Tenn.; C. E. Swanson, Chicago, Ill.; Syracuse-McIntyre Company, Syracuse, N. Y.; Werick Bros. Motor Car Company, Buffalo, N. Y.; George R. Beeson, Connersville, Ind.; Kingman Plow Company, St. Louis, Mo.; Bradley, Merriam & Smith, Council Bluffs, Ia.; E. Wiley Hill, Butte, Mont.; McKee & Scott, Fresno and Bakersfield, Cal.; McIntyre Auto Sales Company, Albany, N. Y.; Standard Motor Truck Company, Boston, Mass.; D. F. Head, Ithaca, N. Y.; H. H. Maurer, New Berlin, Penn.; Lovegrove & Co., Philadelphia, Penn.; F. B. Austin, Little Falls, N. Y.; Banta Bros., Peoria, Ill.; J. J. Aker, Schenectary, N. Y.; Owen M. Smith, South Whitley, Ind.; F. A. Burmeister, Memphis, Tenn.; Hartford City Auto Company, Hartford City, Ind.; J. August Schmidt, Gloversville, N. Y.

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NEW YORK'S ANNUAL DEMONSTRATION.

Motor Truck Club's Second Parade Indicates Business Concerns in the Metropolis Have Increased Their Motor Equipment at Least 100 Per Cent.

A DEMONSTRATION which will have a decided practical value in furthering the interests of the commercial vehicle industry was held in the second annual parade of the Motor Truck Club in New York City, April 13. Not only were there something over 400 machines in line, as compared with the 234 of 1911, indicating a gain of at least 100 per cent. in the number of such vehicles utilized by the business interests in the metropolis, but the plans this year contemplated something more than a pageant. Nearly all of the entries were made by owners, and in many instances the cars were loaded with actual deliveries which were made up-town after the parade was disbanded at 125th street.

The formation was at Battery Park, and the parade moved directly up Broadway, save for a short detour through 22nd street, Fourth avenue, 27th street, Fifth avenue and 48th street, this being for the purpose of visiting the business section of the city, at a time when the demonstration of the city's progress in modern transportation equipment would prove most beneficial to business interests. Preceding the entrants was a Fifth avenue motor omnibus, on top of which was carried the band, and supplementary trumpeters were disposed at intervals throughout the formation.



Formation of New York's Second Annual Parade of Commercial Vehicles at Battery Park Ready for the Start.

Herewith is presented the official entry list, from which it will be seen that numerous trucks were in line which appeared at the last moment and were assigned places without their names appearing on the list. By actual count at the reviewing point, Broadway and 100th street, there were 420 vehicles represented, although it is estimated that nearer 500 took part at one time or another. Some idea of the extent of the parade may be gained from the fact that it took 50 minutes for it to pass a given point.

Practically every type of car was represented, from the small electric crane trucks of the General Vehicle Company to the 10-ton Hewitts, made by the International Motor Company, and not forgetting to mention the two three-wheeled Martin tractors of the Knox Automobile Company. There were three of the G. V. electric cranes, and these attracted much favorable comment throughout the entire journey.

The plan of adopting a one-way route undoubtedly had much to do with bringing out the entries. In other respects it had its special advantages over the scheme of last year, when the trucks made a circuit of the upper end of the city. Perfect order was maintained at the start and the machines formed an unbroken procession in three divisions, but because of the excessive traffic in the business section, the parade was more or less scattered at times, a number of gaps showing in the line.

The largest number of cars of any one make in line was the G. V., made by the General Vehicle Company, Long Island City, N. Y., with 49, of which but five were entered by the company itself. Second place went to the Autocar Company, Ardmore, Penn., with 46, but in this instance the Autocar Sales Company was represented by 25. The International Motor Company, New York City, had no less than 57, these being divided between 25 Macks, 13 Saurers and nine Hewitts. It should be remembered that these figures are based upon the official entry list and might possibly need revision were it possible to secure a full count of those in line.

Other concerns represented, with the number of cars for each, according to this same source of information, were: United States Motor Company, (Alden Sampson Manufacturing Company) New York City, Sampson, 38; General Motors Truck Company, Detroit, G. M. C., 31; Knox Automobile Company, Springfield, Mass., Knox and Martin tractor, 16; American Locomotive Company, New York City, Alco, 14; Knickerbocker Motor Truck Manufacturing Company, New York City, Knickerbocker, 10; Wyckoff, Church & Partridge, Inc., New York City, Commer, 10; Packard Motor Car Company, Detroit, Packard, 10; Pierce-Arrow Motor Car Company, Buffalo, Pierce-Ar-

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row, nine; Walter Motor Truck Company, New York, Walter, nine; Mais Motor Truck Company, Indianapolis, Mais, eight; Peerless Motor Car Company, Cleveland, O., Peerless, seven; Couple-Gear Freight-Wheel Company, Grand Rapids, Mich., Couple-Gear electric, seven; Gaggenau, seven; Chase Motor Truck Company, Syracuse, N. Y., Chase, six; Mercedes, six; White Company, Cleveland, O., White, five; Universal Motor Truck Company, Detroit, Universal, four; Studebaker Corporation, Cleveland, O., Studebaker two; Pope Manufacturing Company, Hartford, Conn., Pope-Hartford, two; Speedwell Motor Car Company, Dayton, O., Speedwell, two; Baker Motor Vehicle Company, Cleveland, O., Baker electric, two; Dayton Auto Truck Company, Dayton, O., Durable Dayton, two; Locomobile Company of America, Bridgeport, Conn., Locomobile, two.

The following were represented by at least one each: Anderson Electric Car Company, Detroit, Detroit electric; Atterbury Motor Car Company, Buffalo, N. Y., Atterbury;

OFFICIAL ENTRY LIST FOR NEW YORK'S ANNUAL TRUCK PARADE.

FIRST DIVISION.

E. W. Curtis, Jr., Grand Marshal, 124 Trucks of 17 Makes.

Owner and Maker	Trucks
Fleishmann Vienna Bakery, Alco.	1
Joseph Stern & Son, Alco.	3
Nathan Schweitzer, Alco.	1
Fred. Ewert, Alco.	1
Heineman Bros., Alco.	1
Reisenweber, Alco.	1
John W. Butler, Alco.	2
Hutweller & Briggs, Alco.	1
Acton Van & Storage Co., Alco.	1
Long Island Express, Alco.	1
J. S. Kinstler, Alco.	1
Anderson Electric Co., Detroit.	1
Atterbury Commercial Truck Co., Atterbury	1
Autocar Sales Co., Autocar.	25
Seeman Bros., Autocar.	2
Autocar Sales Co., Autocar.	15
N. Y. Edison Co., Baker.	2
Bronx Electric Truck Co., Bronx.	1
Curtis-Blaisdell Co., Couple-Gear.	5
Leonard Bros., Couple-Gear.	2
John Wegmann, Buick.	1
Consolidated Gas Co., Cadillac.	1
Woodburn Langmuir, Champion.	1
Chase Motor Truck Co., Chase.	6
James T. Smith, Dayton.	1
E. W. McClove & Son, Dayton.	1
Federal Truck Co., Federal.	1
Abendroth & Root, Frontenac.	1
Loewers Brewery, Gaggenau.	1
Standard Oil Co., Gaggenau.	1
Jacob Ruppert, Gaggenau.	1
Weingarten Bros., Gaggenau.	1
Est. Ed. A. Ladew, Gaggenau.	1
United Cigar Stores, Gaggenau.	1
Monroe-Eckstein Brewing Co., Gaggenau	1
James Butler, G. M. C.	5
Waite's Storage Warehouse, G.M.C.	1
Jacob Ruppert, G. M. C.	1
Powell's, G. M. C.	1
General Motors Co., G. M. C.	20
General Motors Co., G. M. C.	3

SECOND DIVISION.

T. A. Aspel, Marshal, 116 Trucks of 13 Makes.

General Vehicle Co., G. V.	5
Sprague Electric Co., G. V.	1
Jacob Ruppert, G. V.	8
Alex. D. Shaw & Co., G. V.	1
Motor Delivery Co., G. V.	3
N. Y. & Queens Electric Light & Power Co., G. V.	1
N. Y. & Queens Electric Light & Power Co., G. V.	2
N. Y. Edison Co., G. V.	5
N. Y. Edison Co., G. V.	1
Jules Weber, G. V.	1
M. Groh's Sons, G. V.	3
Brooklyn Edison Co., G. V.	2
Lincoln Safe Deposit Co., G. V.	2
Lincoln Safe Deposit Co, G. V.	1
Curtis-Blaisdell Coal Co., G. V.	1
John Meyer, G. V.	2
W. B. A. Jurgens, G. V.	1
Tiffany Studios, G. V.	1
Repetti, G. V.	1
General Electric Co., G. V.	1
Peter Doelger, G. V.	3
United Electric Co., G. V.	3
Sam S. Glauber, G. V.	1
E. Greenberger & Co., Grabowsky	1
Simpson Crawford Co., Grabowsky	1
G. & A. Carburetor Co., Gramm.	1
Coal Boulet Co., Hewitt.	3
Emerson Drug Co., Hewitt.	1
R-C-H Corporation, Hupp-Yeats.	1
W. L. Byrnes, Knickerbocker.	1
A. F. W. Bursch, Knickerbocker.	1
Columbia Theatrical Trans. Co., Knickerbocker	1
Ebling Brewing Co., Knickerb'ker	2
Wm. Farrell & Son, Knickerb'ker	1
Philip Kenze, Knickerbocker.	1
McKinley Storage Co., Knickerb'r	1
Streat Coal Co., Knickerbocker.	1
Wm. Kroepke, Knickerbocker.	1
Armstrong Express Co., Knox.	1
Colwell Lead Co., Knox.	1
Hencken & Willenbrock, Knox.	1
Ostermoor & Co., Knox.	1
Phoenix Cheese Co., Knox.	1
M. J. Wolfe, Knox.	1
Richard Webber, Knox.	1
John A. Schwarz, Knox.	1
Brainard Bros, Knox.	1
Hy. & S. G. Lindeman, Knox.	1
Borno Hat Co., Knox.	1
Feigenspan Brewing Co., Knox.	1
E. W. McClove & Son, Martin tractor	1
Knox Auto Co., Martin tractor.	1
Hydraulic Truck Sales Co., La France	1
Phineas Jones & Co., Lauth-Juergens	1
Columbia Storage Warehouse, Lansden	1
Chicago Pneu. Tool Co., Little Giant	3
Locomobile Co., Locomobile.	2
Swinehart Tire Co., Mack.	1
M. Zimmerman Co., Mack.	1
S. Karpen & Bro., Mack.	1
A. D. Matthews & Sons, Mack.	1
G. Robinson & Son, Mack.	1
International Motor Co., Mack.	10
Morgan Bros., Mack.	1
Harlem & Fulton Market, Mack.	3
Sol Cirker, Mack.	1
Goodyear Tire Co., Mack.	1
Eberling Brewing Co., Mack.	1
Jos. Dixon Crucible Co., Mack.	1

THIRD DIVISION.

C. W. Fletcher, Marshal, 104 Trucks of 23 Makes.

Stewart Automobile Co., Mais.	8
Daimler Import Co., Mercedes (fire engine)	1
Liberman Dairy Co., Mercedes.	1
Daimler Import Co., Mercedes.	4
B. F. Goodrich Co., Packard.	4
Francis H. Leggett, Packard.	1
Adams Express Co., Packard.	1
John J. Timmons, Packard.	1
Francis H. Leggett, Garford.	1
John J. Timmons, Walter.	3
Seeman Bros., Packard.	2
T. G. Patterson, Packard.	1
E. Pritchard, Packard.	1
Packers' Motor Truck Co., Packers	1
Runkel Bros., Packers.	2
B. T. Babbitt Co., Peerless.	4
Peerless Motor Car Co., Peerless	1
Leonard & Mitchell Bros., Peerless	1
N. Y. Bottling Co., Peerless.	1
Jos. Dixon Crucible Co., Pierce.	1
Recht & Rosenbaum, Pierce-Arrow	1
Muntha & Schmohl, Pierce-Arrow	1
Mergenthaler Linotype Co., Pierce-Arrow	1
Chemung Spring Water Co., Pierce-Arrow	1
Jones Bros., Pierce-Arrow.	2
C. H. Evans & Sons, Pierce-Arrow	1
Ames Transfer Co., Pierce-Arrow.	1
Akron Rub. Tire Co., Plymouth.	1
Pope-Hartford Auto Co., Pope-Hartford	1
W. J. & S. H. Davenport, Pope-Hartford	1
Long Island Cons. Car Co., Poss.	1
Remington Standard Motor Co., Remington	1
Renault Freres Selling Branch, Renault	1
James T. Smith, Reo.	3
Geo. I. Pound, Rowe.	1
Reilly Electrotype Co., Sampson.	1
Politzner Bros., Sampson.	1
Jacob Ruppert, Sampson.	1
Rohe & Son, Sampson.	1
U. S. Motor Co., Sampson.	3
Pure Oil Co., Sampson.	1
United Motor N. Y. Co., Sampson.	23
Hecker-Jones-Jewell, Sampson.	5
Advance Motor Express, Saurer.	1
Austen & Bergdoll, Saurer.	1
International Motor Co., Saurer.	6
S. E. Reynolds, Sampson.	1
S. J. Kornblum, Sampson.	1
Seeman Bros., Saurer.	2
Wm. P. McDonald Construction Co., Saurer.	1
Speedwell Motor Truck, Speedwell	2
Berkshire Spring Co., Universal.	1
E. Greenberger & Co., Victor.	1
Columbia Storage Warehouse, Walter	2
James A. McClurg, Walter.	1
Hess Bros., Walter.	1
Simon Strauss, Walter.	1
Am'n Pastry & Mfg. Co., Walter.	1
Louis Rapette, Walter.	1
A. M. Powell Walter.	1
Walter Motor Truck Co., Walter.	2
Geo. B. Cohens Son, White.	1
May Manton Pattern Co., White.	1
White Star Motor & Engine Co., White Star.	3

electric, four; Grabowsky Power Wagon Company, Detroit, Grabowsky, four; Chicago Pneumatic Tool Company, Chicago, Little Giant, four; Lauth-Juergens Motor Car Company, Fremont, O., Lauth-Juergens, three; Reo Motor Car Company, Lansing, Mich., Reo, three; Packers Motor Truck Company, Wheeling, W. Va., Packers, three; White Star Motor & Engine Company, New York City, White Star, three; Rowe Motor Company, Coatesville, Penn., Rowe, Bronx Electric Vehicle Company, New York City, Bronx electric; Buick Motor Company, Flint, Mich., Buick; Cadillac Motor Car Company, Detroit, Cadillac; Milwaukee Auto Truck & Manufacturing Company, Milwaukee, Wis., Champion; Federal Motor Truck Company, Detroit, Federal; Abendroth & Root Manufacturing Company, Newburgh, N. Y., Frontenac; Garford Company, Elyria, O., Garford; Gramm Motor Truck Company, Lima, O., Gramm; R-C-H

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"Father Knickerbocker" at the Wheel of Knickerbocker Truck in New York's Parade.

Corporation, Detroit, Hupp-Yeats electric; Hydraulic Truck Sales Company, New York City, La France; Lansden Company, Newark, N. J., Lansden electric; Poss Motor Company, Detroit, Poss; Victor Motor Truck Company, Buffalo, N. Y., Victor; Plymouth Motor Truck Company, Plymouth, O., Plymouth; Remington Standard Motor Car Company, New York City, Remington; Waverley Company, Indianapolis, Ind., Waverley electric.

The first division was headed by Chief Marshal E. W. Curtis, Jr., and was composed of 124 trucks of 17 different makes. The second was in charge of T. A. Aspel, this comprising 116 vehicles of 13 makes. C. W. Fletcher was marshal of the third division, in which there were 104 of 23 makes. Besides the chiefs of divisions the following assisted as aides: G. M. Curran, International Motor Company; D. D. Robinson, Baker electrics; R. R. Clayton, Studebaker Corporation; H. C. Brown, Sampson, F. B. Kutz, Pierce-Arrow; E. A. Bedell, B. F Goodrich Company; N. Mallouf, Peerless; P. J. Dougherty, Detroit electric; F. W. Dix, Pope-Hartford; C. W. Wurster, Commer; E. O. Hoopgartner, Swinehart Tire & Rubber Company; J. M. Young, Chase; Melvin J. Adams, Alco; J. L. Breese, Jr., Commer; G. E. Anderson, Goodrich tires; A. L. Baringer, Sampson; G. L. Moore, Swinehart tires, and William H. Langford, Remington.

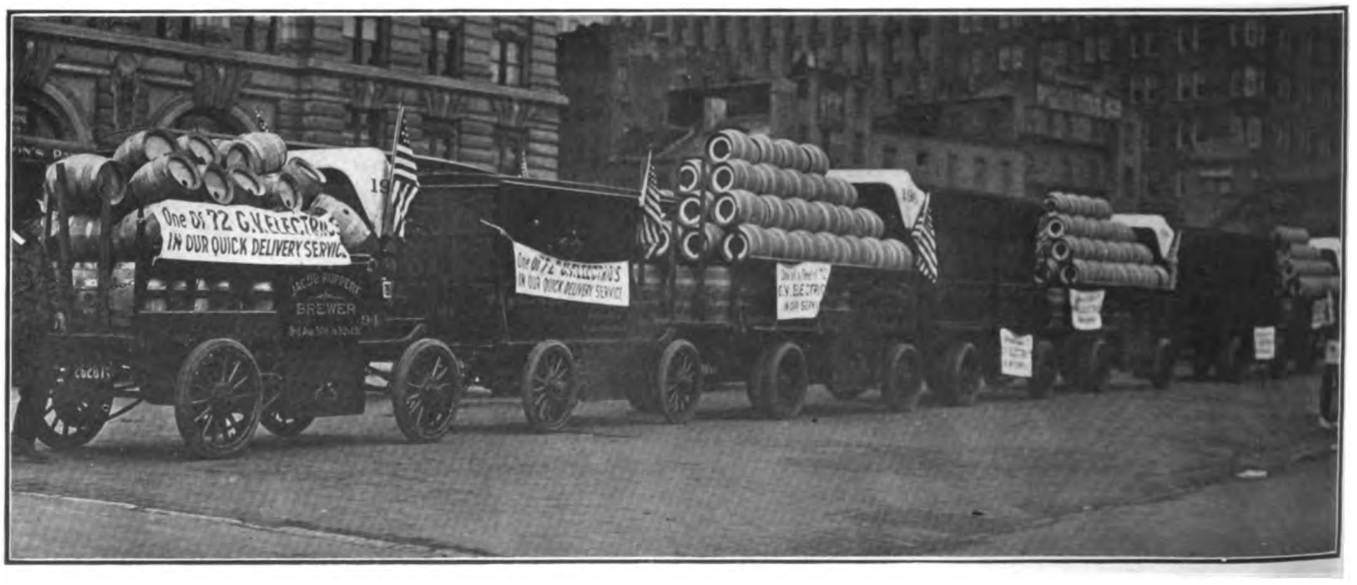
AMERICAN EXPRESS COMPANY'S CARS.

Five years ago the American Express Company, New York City, did not have a single motor truck, taking care of its hauling by horse drawn vehicles. About 1600 horses were used, these being housed in 25 stables. In 1907 it was decided to try out a number of motors and an electric was placed in service, followed the next year by a gasoline vehicle, and in 1909 by 15 three-ton gas trucks and four electrics. Careful records were kept of the two types of cars, and these showed that the gasoline truck was superior for the long hauls between the depots and delivery stations, while the sphere of the electric was found to lie in the shorter delivery routes.

The result of the experiment by the American Express Company was that last year 20 gasoline cars and 75 electrics were ordered, making a fleet of 40 gasoline cars and 80 electrics. In addition to this large motor equipment, about 1300 horses are still retained by the company. The business handled by this equipment can be estimated readily when it is known that the average figures show 60,000 packages are carried daily.

The company plans to do away with horses to a large extent, and preparations are being made to add 100 machines to the present equipment of 120. The company's building on 42nd street is to be remodelled into a modern electric vehicle garage. The second floor will be fitted with charging accommodations for 100 machines, and will be reached by means of four six-ton electric elevators. Of course, the charging will be in the hands of an expert, and one of the features of the system will be an annunciator which will signal when a truck's battery is charged, notifying the operator to throw the switch.

The chauffeurs for the motors were taken from the ranks of the horse drivers, who found no difficulty in handling electrics. The gasoline cars, however, were given only to those who displayed some mechanical ability. All these men knew the geography of the city and were familiar with the work, so that no time was lost in making use of the motor equipment as fast as it was acquired.



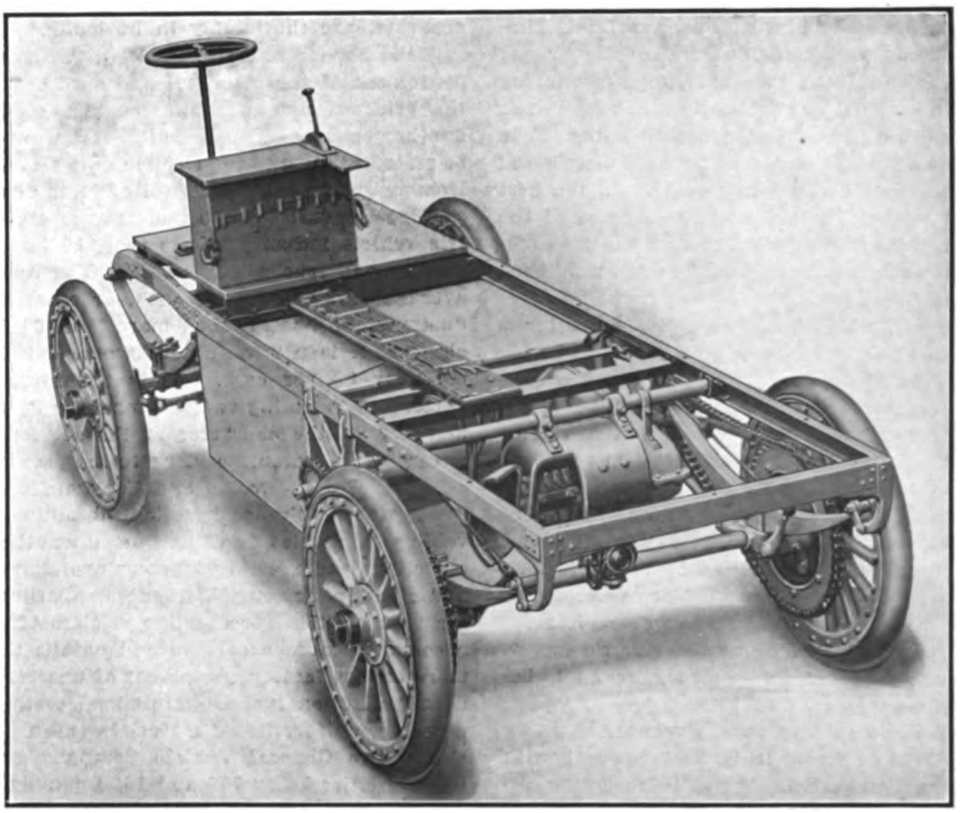
A Portion of Jacob Ruppert's Fleet of 72 G. V. Electric Vehicles Taking Part in the Motor Truck Club's Second Annual Parade in New York City.

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G. V. ELECTRIC TRUCKS AND WAGONS.

THE possibilities of the electric motor driven vehicle in highway transportation are not often understood. Those considering haulage subjects are inclined to eliminate the electrics simply through lack of knowledge of the service that may be obtained with them. Those who are informed understand that there is a definite use or uses for such transports, and long experience has well established the efficiency of the electric wagon. Those who adopt them do not experiment. There is no uncertainty from any point of view.

Perhaps one of the most misleading and erroneous suppositions is that horsepower rating of the electric wagon is comparable with other forms of power generators. That is, that the electric motor has not capacity or productiveness because it is not rated as are other engines and motors. It might be well to emphasize that the motor of the electric service wagon is capable of sustaining a 300 per cent. overload (developing practically four times its rated power) while the average motor or engine will only produce its rating at or very near its maximum production. With this fact in mind the electric vehicle appears in an entirely different light.



The General Vehicle Company's Standard Chassis for a Light Delivery Wagon.

Another cause for confusion is the assumption that capacity is measured by the mileage that may be made. The mile-an-hour speed of the conveyance is multiplied by the 10 hours regarded as a working day, and the total appears to be much more than can be made with an electric, when as a matter of fact, the actual daily travel may be not more than 40 miles for a delivery wagon and 30 miles for a truck.

The remainder of the time is given over to loading, unloading, waits, stops in traffic and other delays. Comparing the work actually accomplished, however, it will be found to be practically twice that possible with horses, to say nothing of the increased load capacity of the electric machine.

The electric wagon or truck is particularly adapted for urban service. It has many qualities that are absolutely necessary for economy of transportation. It can be utilized in congested traffic with a certainty that is surprising and it has a flexibility of movement that minimizes wear of working parts and tires. The motor has elasticity the equal of the steam engine and there are no stresses that are destructive of the chassis.

The endurance of the electric wagon is surprising. It is far greater than the animal vehicle and the animal in service. It is the experience that the average horse will serve from three to five years if worked on the paved streets of a city. A first class wagon will endure perhaps five years. The General Vehicle Company, Long Island City, N. Y., after an experience covering a dozen years, makes the positive statement that the machines it builds can be depreciated at the rate of 10 per cent. a year, an assurance that has a liberal margin. As a matter of fact the first vehicles that this company built are now in daily service in New York City, after nearly 12 years' constant work.

Great Progress Made.

It is certain enough that great progress has been made in vehicle construction during the period mentioned. When it is realized that the first wagons were more or less experimental, and that each succeeding design has been improved, it will be admitted that results with the latest types ought to be even more satisfactory and basing expectations on actual knowledge, the percentage of depreciation may be somewhat lessened.

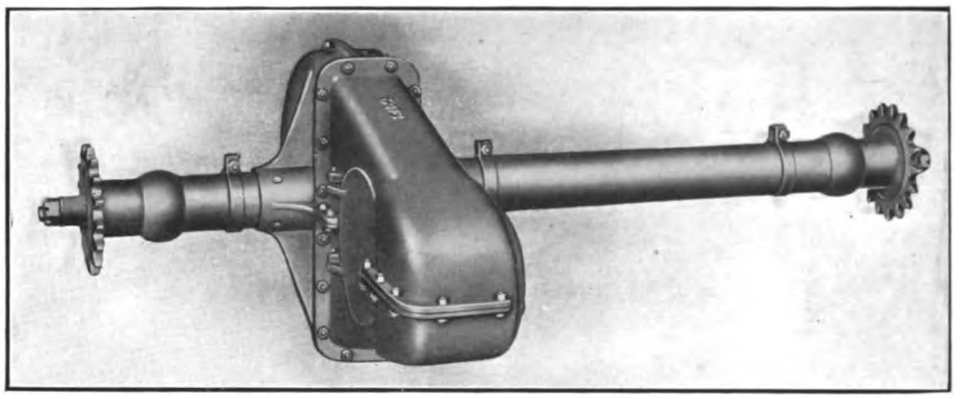
There is no question that this small depreciation is a very potent factor in estimating cost of service. Taking the figure set by the General Vehicle Company as a standard it will be understood that there is a difference of from 10 to 15 per cent. annually as compared with other types of machines. Assuming that all other conditions were equal this would be sufficient justification for any business man to decide that the electric truck was desirable.

There is no stronger argument than this when economy is considered, and yet the cost of maintenance is decidedly small. This, of course, implies that there will be regular and systematic care. This must be given with animals and other forms of vehicles, and it is assumed that attention will be uniform.

Simplicity of Operation.

Those who are asked to consider electric machines look upon them as being complicated and mysterious. As a matter of fact there is nothing more simple than this form of chassis, for there is but little aside from the motor, battery, controller, and the frame and wheels. Instead of puzzling problems the attention necessary with the motor and the battery can be given by any intelligent person. It is not essential to have a special training to care for either.

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The Countershaft Housing and the Assembly, with the Case That Houses the Drive Pinion and Gear and the Morse Silent Chain.

Mechanical knowledge is not imperative, though desirable, but common sense will amply qualify one to give the needed attention. This statement is not intended to belittle mechanical skill or capacity, but to emphasize how absolutely simple the electric truck or wagon really is.

It may be well to point out that companies producing power for public service exist in practically all communities of proportions, very often in connection with lighting. The power may be created by steam or water, but it is distributed as electrical energy and is utilized in motors. In the best equipped shops and works it is the custom, because of the undoubted economy, to have individual motors for each machine. The value of such installations has been established beyond question.

No business man will maintain that the electric motor is not dependable. Hundreds of thousands of them are in use each day, from the tiny equipment that will operate a sewing machine to the motor that energizes an entire plant. These motors are operated day after day and month after month, with surprisingly little attention. Cleanliness and sufficient lubrication are the two essentials. There is a very small loss of efficiency through wear. There is no other type of energizer that will show so slight a loss of power, and the electric motor has the quality of delivering its capacity instantly and for as long a period as is necessary.

The manufacturer who has modern power equipment for his mill, shop or works will indorse the electric motor. He will accept a statement for its efficiency as final, because he knows from experience.

Practical Service at Minimum Expense.

Turning to the vehicle itself it is best to deal with facts that cannot be controverted. There is no better authority in America, perhaps not in the world, than the General Vehicle Company, which has produced machines for more than 11 years—since it was established Jan. 1, 1901. It is well to state that no other types have ever been built and as the company was created as a business enterprise, by men accustomed to large undertakings and desirous of attaining a large measure of success, nothing was sacrificed to sentiment. The wagons were first of all designed with the object of securing extreme endurance. Capacity was an equally potent factor, and this included load carrying and speed and mileage. But with these the matter of economy was carefully considered. The economic aspect of the electric has been studied to obtain the largest practical service at the minimum expense.

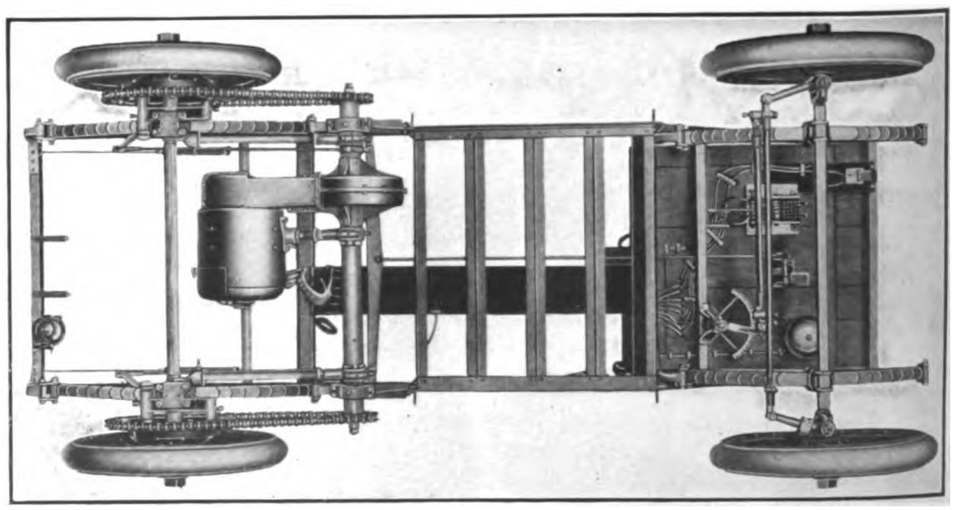
It is an undisputed fact that during the past decade remarkable progress has been made in the perfection of the electric motor. The very general use of electricity for lighting and power has reduced the cost of energy from 66 to 75 per cent. With the improvement of the motor and the reduction in price of current it is not unreasonable to assume that the actual cost of driving an electric vehicle a mile today is about 80 per cent. less than it was 10 years ago. Thus it will be seen that the present economy of the electric is due to two entirely different influences, which, while in every way separate, are thoroughly in harmony.

It is not too much to expect that there will be equal improvement of the machines and a still further reduction of the price of current. The increase of battery capacity is another equally certain result. But what has been and will be stated relative to the electric wagon is not based on speculation. It is merely a recital of facts of record.

The General Vehicle Company is a pioneer in the electric vehicle industry. Less than 100 customers own 1000 wagons and trucks it has built. Twenty customers own an average of 30.6 vehicles each, or a total of 612. One industry alone has invested more than $1,000,000 in its machines. It is pointed out that of the 1911 business of the company 69 per cent. was in the form of reorders from customers operating vehicles made by it, a remarkable commentary on the character of the service obtained and the nature of the attention given to the patrons.

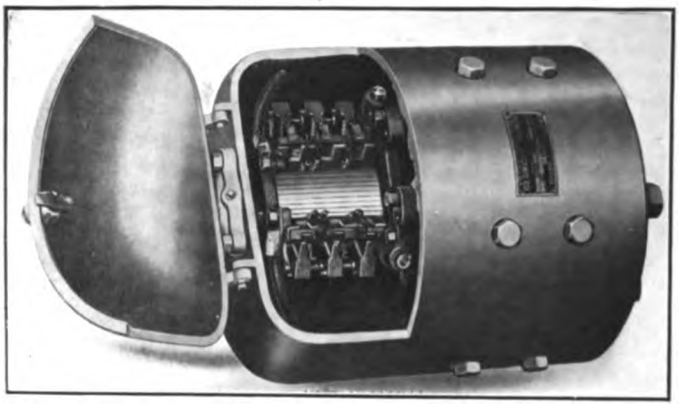
Design and Construction.

Obviously the satisfaction obtaining with an electric vehicle in service is dependent upon the design and construction, and the three factors are simplicity, accessibility and standardization. Without standardization the vehicles must be built to specification, a class of production that is necessarily more expensive and entails the maintenance of more or less factory equipment of uncertain productiveness. Standardization insures minimized cost, equality of workmanship, uniformity of materials and a continuation of design. The General Vehicle Company produces six types, the capacities being 750 and 1000 pounds, one, two, 3.5 and



View of Standard Chassis as Seen from Below, Illustrating the Simplicity of Construction.

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The General Vehicle Standard Motor with the Shell Opened Exposing the Commutator.

five tons, respectively. These are designed to meet the requirements of practically any delivery or haulage service.

The speed in miles an hour for each vehicle is as follows: 750 pounds, 12; 1000 pounds, 12; one ton, 10; two tons, nine; 3.5 tons, eight; five tons, seven. The mileage radius of each vehicle in the order given is 45, 45, 45, 45, 40 and 35, respectively, with lead or acid batteries, and with Edison or alkali battery the radius is 45, 43, 54, 45, 40 and 40, respectively. It should be understood that the mileage is guaranteed for each wagon or truck, carrying a capacity load for half the distance. In other words the battery capacity of the vehicles is sufficient to carry a load from 17.5 to 22.5 miles and return with the acid installation, and from 20 to 27 miles with the alkali batteries, according to the type in service. Under normal conditions of operation the batteries will afford from five to six hours constant service of the wagons and trucks without recharging.

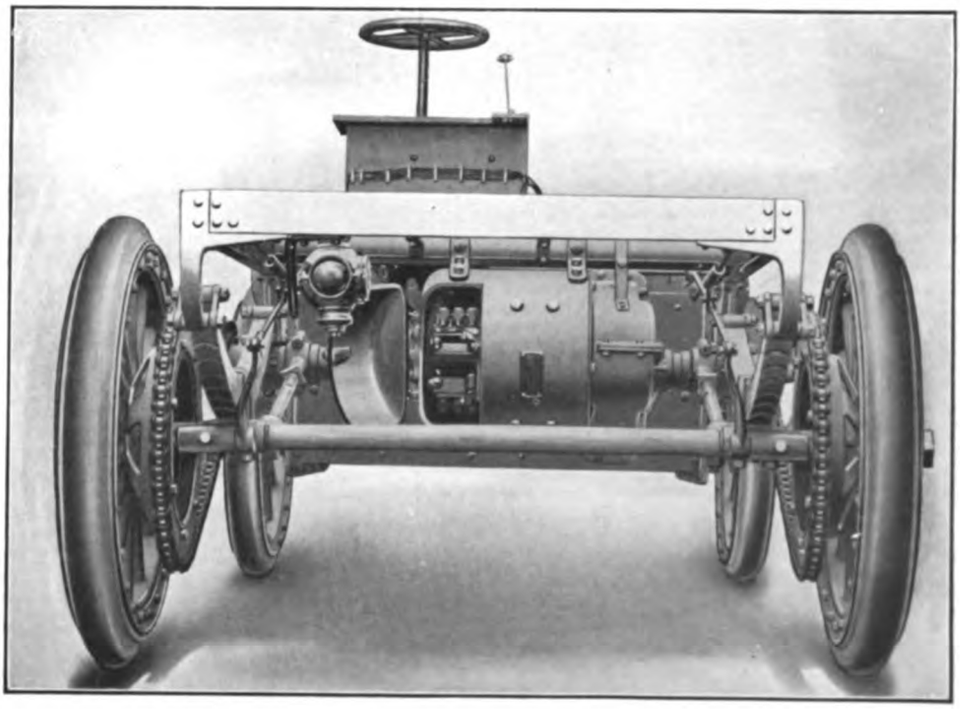
The General Vehicle Company's transports are extremely simple in design. They are, so far as the motor and controller are concerned, practically adaptations of the street car equipment, the only difference being that the street car is driven on the rails and the wagon is driven on the road, and that the energy of the latter is taken from a stored battery instead of from the charged wires. There is nothing complex or mysterious in this. The endurance of the street car motor is known of all persons, no matter whether they possess electrical or mechanical knowledge. With the street car equipment there is the possibility of the motor being "burned" by a short circuit because of the heavy voltage with which the feed wires are charged, but such happenings are rare considering the number of motors in use. With the motor used in the vehicle, however, there is no such probability because there is a limit to the capacity of the battery, and the motor is constructed expressly to resist an overload of 300 per cent. with entire safety. The motor cannot be damaged. The battery can be charged as often as is necessary, which is usually once the night of each working day. Charged and discharged with regularity the life of a battery is very long. As to the other working parts of the chassis there is nothing that will wear unduly. The components are not subjected to severe stresses and because of that fact have lengthy endurance.

Power Plant.

The motor or power plant of the electric vehicle is a standardized product of the General Electric Company, the largest maker of motors in the world. It is made to endure and it is given absolute protection by a cast steel shell or case. In this case at either end is mounted the imported annular ball bearing in which the armature shaft is installed, this minimizing the friction losses and insuring a high efficiency. The field pole pieces are a laminated iron construction. The field and armature coils are perfectly insulated and are made water proof. The armature shaft is tapered and the driving pinion is attached to it by a lock washer and nut. The commutator segments are of proportions that insure sufficient commutation with all loads and long life of all the parts. The brush holders are simple and enduring and graphite brushes are used, these being strong and yet offering little resistance to the current. A section of the motor case is mounted on hinges and it may be so tightly closed as to resist dust, water and oil, yet in a few seconds the interior of the case and the motor may be reached for examination or attention.

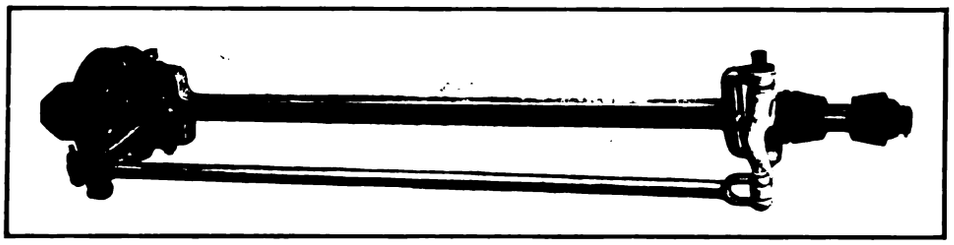
The motor is suspended from a large tubular cross member that is fitted to the chassis frame and it is given rigidity by a tubular member that corresponds to a torsion tube extending from the motor shell to the jackshaft housing. This may be noted in the bottom view of the chassis.

The jackshaft is mounted in self-aligning ball sleeves in heavy brackets fitted to the bottom of the chassis frame, the construction being such that the entire countershaft may be protected from stresses should there be distortion of the frame. The countershaft may be handled as a unit. Within the housing are the two short driving shafts connected with a differential of the spur gear type, these being mounted on four long roller bearings. The outer end of each shaft carries a sprocket. The drive is from the motor pinion to the differential gear by a Morse silent chain. This chain is enclosed in a water and dust proof housing and there is a large inspection hole at the side. The chain is driven in a bath of oil. The first reduction is by the drive from the motor to the countershaft and the second is from



Rear of Standard Chassis, Showing the Manner of Installing the Motor and Its Extreme Simplicity.

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The Front Axle of the General Vehicle Chassis, of Sturdy Construction, and the Roller Bearing Spindle Equipment.

the countershaft by roller chains and sprockets on the rear wheels.

This is practically all the mechanism of the vehicle, aside from the wheels, steering connection, springs and brakes, so it will be seen there is construction of the simplest form.

Chassis Frame.

The chassis frame is of channel section pressed steel well braced with cross members. There is no difference with any type save in proportions, each being exactly alike. All connections of members are braced with vanadium steel brackets, all hot riveted. The countershaft brackets and the spring hangers are of vanadium steel, carefully heat treated. The frame carries the motor and countershaft as has been described and from it, forward of the countershaft, is carried the battery. This is installed in an iron box sheathed with wood to protect the metal from causes for deterioration. The weight is very low and the centre of gravity is correspondingly lessened, a very desirable quality with any vehicle.

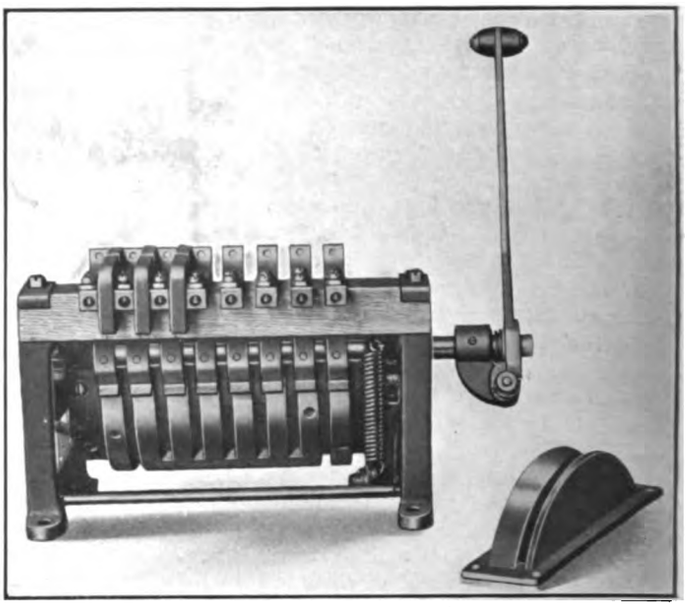
The frame is suspended on half-elliptic springs, oil tempered, that are as little curved as is practical and obtain sufficient clearance, the reduction of the curve minimizing the friction between the leaves. The rear springs are shackled at both ends, this affording the greatest degree of action without stress, the driving strain being taken by radius rods that extend from the dead rear axle to the countershaft housing, being fitted close to frame. The spring clips are heavy and the shackles and bolts are of a specially fine grade of material.

The axles are of 40-carbon, open hearth steel, the forward axles being I section and the rear axles tubular, of ample proportions. The wheels are all mounted on Timken roller bearings, which are packed with grease and require but little attention other than to renew the lubricant as occasion demands. The steering gear is a pinion and sector type, built by the company, the steering column being fixed to the chassis and the connections being made with universal joints. All wearing parts are bushed with steel and may be replaced as worn. Ample provision is made for lubricating all the moving members where they contact.

The wheels are an artillery type, fitted with solid rubber tires, dual members being used on the rear wheel of the larger and heavier trucks. The brakes are within drums carried on the rear wheels. They are of the internal expanding form and are operated by a pedal at the base of the steering post through a long rod connected with an equalizer and thence by linkage to the toggle levers that actuate the leather-faced brake shoes. The linkage is so compounded that a comparatively easy pressure will cause the wheels to lock. The means for adjustment of the brakes are in every way sufficient.

Battery Equipment.

The storage battery used has been standardized. It is always composed of 44 cells, ranging from nine medium to 21 medium plates to a cell, contained in from four to six crates. The capacities range from 112 to 280 ampere-hours.

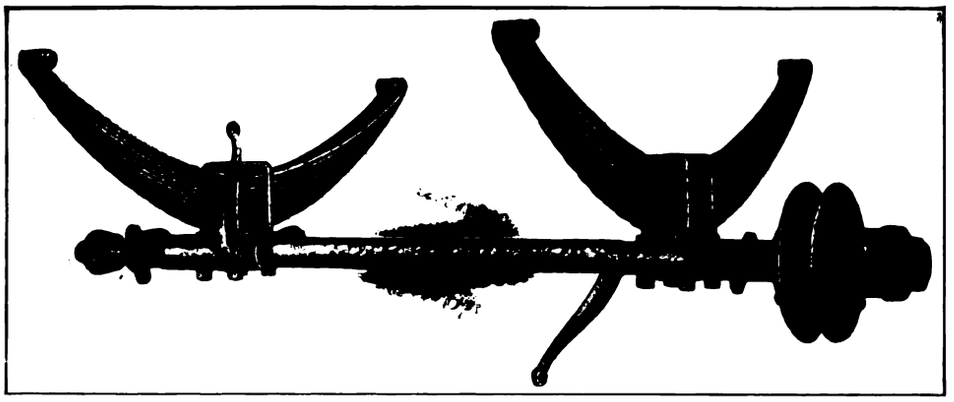


The Controller by Which the Movement and the Speed of the Chassis Are Governed.

The battery cradles are deep enough to permit the use of high bridged jars, with two bridges each 2.75 inches high. The same size of wood and rubber separator is used between the plates in all batteries and the electrolyte has the same density. The rubber jars of differing sizes have the same thickness of wall, and the elements fit exactly all jars, making for complete interchangeability.

The motors are rated by number and are standard with voltage of 85, but the amperage varies from 16 with the 750-pound wagon to 40 with the 3.5 and five-ton trucks. The 750-pound wagon motor is rated at 1600 revolutions and the 1000-pound wagon motor at 2000, but the others are uniform at 1200. The figures are for the lead or acid batteries, and do not apply with the Edison or alkali battery.

The controller is the continuous torque type built by the General Electric Company and it is exactly the same as those used in



The Rear Axle and Springs, Showing the Roller Bearing, Wheel Hub Flange and the Levers for the Internal Expanding Brake.

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street railway practise, save that it has the axis of the rotable insulated semi-cylinder parallel to the horizon instead of vertical, as with the street car installations.

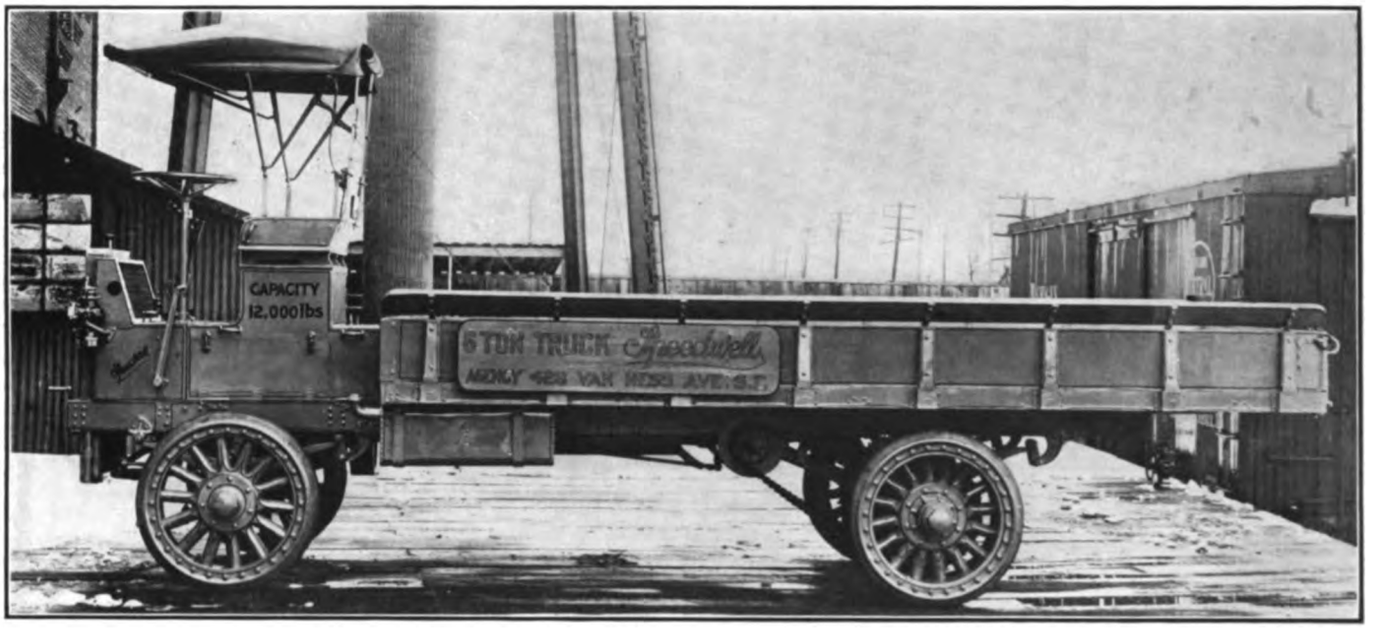
On the circumference of the semi-cylinder is a number of copper contact blocks arranged to make the desired connection with the copper fingers of the controller, which are connected with the terminals of the battery, resistance and the motor. This controller is placed beneath the driver's seat and it is actuated by a lever that is at the side of the operator. There are four forward speeds and two reverse, and the method of operation is simply pushing the lever in the direction one wishes to move. The motor speeds are changed by degrees and there is no shock or sudden engagement of the motor. The wiring systems between the controller and battery, the battery and motor, and the motor and controller are substantial cable, thoroughly insulated so as to be protected against water, oil, mud and acid. The cable is firmly secured to a wooden member and cannot be shaken loose or affected by the vibration of the chassis.

It will be seen that there is nothing that will produce complications in the electric vehicle chassis. The control is so simple as to be surprising to those who begin to drive them. There is a steering wheel, a single pedal that operates the brake, and the controller handle that controls the motor. There are no gears to shift, and no other pedals to push, or hand levers to move. The condition of the battery is indicated by an ammeter, or a sangometer. When the driver leaves the vehicle he turns a switch and machine cannot be started until the connection is again made.

The electric vehicle is the acme of simplicity. It is clean, it is suited for any form of haulage, and it has every quality in service that could be desired to the limitations stated.

SPEEDWELL REPLACING MULE WAGONS IN CALIFORNIA.

WHAT is believed to be one of the largest haulage problems to be undertaken by mechanical transports, and one involving approximately 260,000 ton-miles, is being solved by a fleet of six Speedwell trucks of six-ton capacity, made by the Speedwell Motor Car Company, Dayton, O., the contract having been closed by L. V. Lynch, who is the company's distributor for northern California.



One of a Fleet of Six-Ton Speedwell Trucks Replacing Mules in Hauling Material for Construction of Huge Dam in Plumas County, Cal.—Over 10,000 Tons Will Be Handled in 200 Days.

The machines will be utilized to transport tonnage consisting largely of cement and lumber, in addition to the commissary supplies for the army of men engaged in the construction of the huge storage dam of the Great Western Power Company at Big Meadows, Plumas county, California. All supplies, etc., will be hauled from Keddie, a distance of 26 miles and over narrow mountain roads abounding with treacherous curves and steep grades. Previously, this work was performed by six and eight mule teams, these averaging a round trip in three days, because of the roads.

Some idea of the amount of material to be hauled may be gained from the announcement that the reservoir made by the dam will be the largest artificial body of water in the country and it is estimated that over 1,000,000 feet of lumber will be required, to say nothing of tons of cement.

Before accepting the order for the trucks, R. Harry Croninger, manager of the truck department of the Speedwell Motor Car Company, and L. V. Lynch, went over the ground very carefully, for the character of the roads and country presented an application different from the ordinary commercial work. In many sections the roads were found to be too narrow to permit of two machines passing and this added to the complications. After studying the situation with the engineers of the Great Western Power Company, the Dayton concern stated that its product could handle the work successfully and economically.

It is proposed to run the trucks in fleets on scheduled time as with steam trains, and teach the other users of the highways the time when the cars will be at passable points. Each power wagon will be equipped with a powerful electric signal which can be heard three miles and it is believed that the signals will be understood readily.

It is estimated that the saving to the highways by the substitution of motor cars over the mule equipment will be considerable. With the latter was employed a wagon having three-inch steel tires, which materially affected the road, but with the trucks this same tonnage or pressure is carried on a surface of 12 inches of rubber.

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THE A B C OF MOTOR TRUCK OPERATION.

A Simple Exposition of the Principles Underlying Operation, Maintenance and Repair of All Motor Driven Commercial Cars, Describing Details of Their Components. Part XVIII—How Power Is Transmitted to the Rear Wheels.

By C. P. Shattuck.

HAVING explained how energy is developed and outlined the function of the clutch and transmission, the next logical step is the method utilized for transmitting the power of the motor to the driving or road wheels. The final drive is an important factor in motor car construction and may be stated to comprise two systems, one employing chains and sprockets and the other a shaft, universal joints and bevel gearing. There are also combinations in which both chain and gearing are utilized. The arrangement of the components of the chassis varies; that is, the power plant may be located in front under the hood and energy transmitted by means of a shaft to the transmission and thence through another shaft to the driving axles, or the motor may be located amidships and the countershaft driven by a single chain and final drive by double members. Although variations exist the basic principle is the same, the designer seeking to obtain the maximum efficiency in the method of drive.

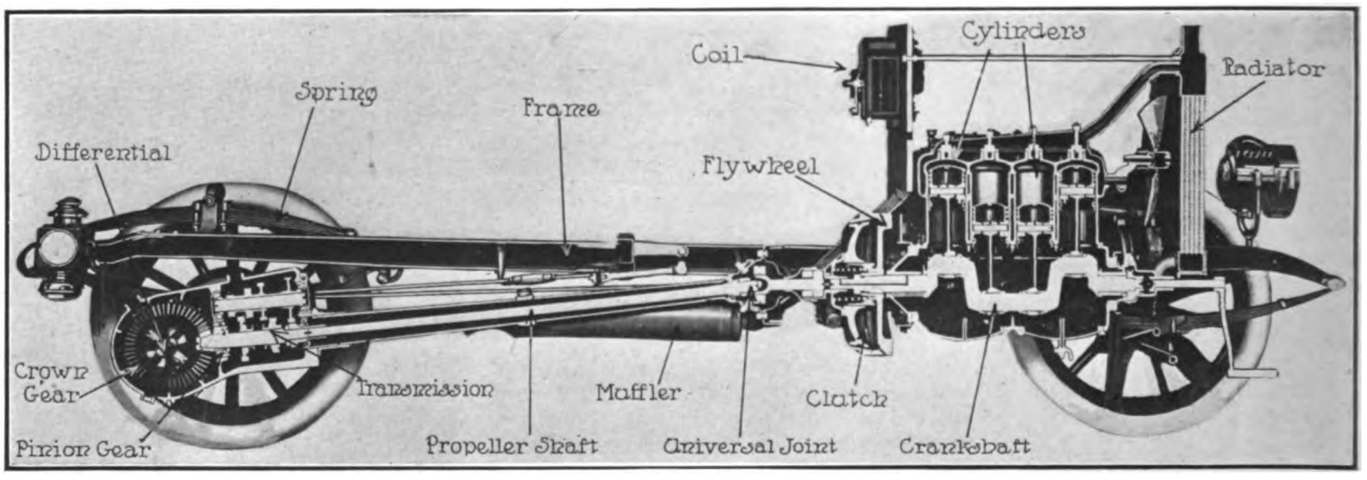


Fig. 74—Chassis of Pleasure Vehicle Bisected to Depict Utilization of Shaft Drive and Live Axle.

Types of Chain Drive.

The chain drive may be sub-divided or classified under two heads; namely, the single chain and live axle, and the double chain and solid or dead axle. Upon cars employing the single chain and live axle, so-called because the road wheels revolve and rotate with it, the latter is usually a cylindrical shaft of steel divided into two parts, to each end of which is attached one of the road members. Between these axles are located the differential or compensating gears which perform the same function as the fifth wheel of a horse drawn vehicle, that of permitting the machine to turn corners. The driving axles are enclosed in a steel tubing made in two sections, and provision is made for the differential and sprocket as well as for securing the axle housing. The latter is sturdily constructed to withstand stresses and so arranged that it may be disassembled for repairs or adjustments.

The axle tubing has supports or spring pads upon which rest and are bolted the springs, and the housing also carries the bearings upon which the axles revolve. These may be of the ball or roller type and usually consist of four members, one on either side of the differential and one under each spring. Energy from the motor is transmitted through the medium of a small sprocket attached to an extension of the crankshaft, and thence by a chain to the larger sprocket on the rear axle. The former is not rotated at the crankshaft speed, the ratio being approximately 3.5 to one; that is, the smaller sprocket makes 3.5 revolutions to one of the large member. For example: The small sprocket may have 12 teeth and the larger 42. Any number of ratios may be obtained by employing different sized sprockets on the driving shaft on which is carried the planetary transmission. This type of drive is utilized on light delivery cars, and of the design it may be said that power is transmitted to the rear wheels with a minimum loss.

The double or side chain drive is generally employed on mechanical transports of large tonnage, and when this form is utilized the rear axle is of the solid or stationary type, and is similar to the axle of the horse drawn vehicle, inasmuch as the wheels revolve on ball or roller bearings. Bolted to the inside of the spokes of each wheel is a large sprocket and upon the frame of the car is mounted a cross shaft known as a counter or jackshaft. This carries at each end one of the smaller sprockets, from which the power is transmitted by chain to the sprocket located on the rear wheel.

Fig. 78 outlines clearly the solid type of rear axle and the large sprocket on the road wheel and the manner of attachment. It will be noted that the axle is substantially constructed and attached to it are the springs, these in turn being secured to the main frame by shackles. In the illustration the wheel is shown removed to expose the end of the axle which is equipped with roller bearings, and the driving sprocket and chain is also outlined. The assembled components are also depicted, and it is obvious that some arrangement is essential to permit the vehicle to turn corners.

Location of Countershaft.

Reference has been made to the countershaft and this member is outlined at Fig. 75. It will be noted that it is

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constructed in two parts or divided near its central portion, which is enlarged to permit of the installation of the compensating gears. In this design power is transmitted from

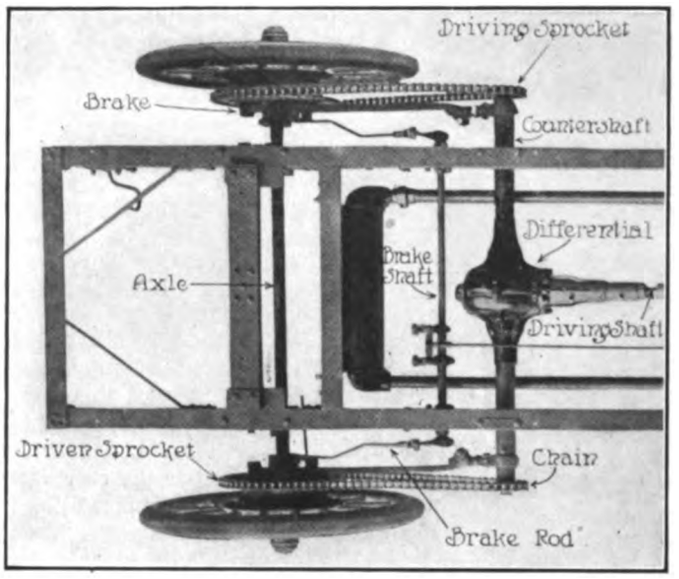


Fig. 75—Outlining Application of Double Chain Drive and Location of Countershaft.

the last gear of the transmission, thence through a shaft to another gear or pinion which rotates the crown gear and subsequently the jackshaft. The latter revolves in ball or roller bearings and its design varies, although the principle involved is similar. To prevent the binding of the countershaft through possible distortion of the frame, a flexible joint is usually provided and in some designs two are employed. Provision is made for lubrication in the form of grease cups or oil holes.

As previously explained, the location of the transmission and differential varies. In some designs these components are a unit as at Fig. 76, which outlines the differential member, also the driven countershaft. This arrangement makes for compactness and strength and the components are protected from dust and mud. Energy from the motor is transmitted through a shaft having universal joints, thence through the mainshaft of the transmission to the driving bevel. The latter rotates the crown gear which in turn imparts motion to the countershaft on which is fitted the sprockets actuating the chains to the sprockets fitted to the road wheels.

Advantages of Chain Drive.

The double chain drive presents many advantages, inasmuch as the axle which carries the load is a solid piece, and being stationary is suitable for supporting heavy loads. The differential mechanism upon its divided shaft is entirely relieved of any weight or shock resisting functions, and may be completely enclosed and operate in oil. For very heavy trucks the double chain drive is indorsed by engineers, and when the chains are enclosed to protect them from dust and mud, the drive is very efficient as loss by friction is reduced to a minimum.

As there is a strong forward pull transmitted to the rear axle by the chains when power is applied, it is obvious that some method of counteracting this force must be incorporated to prevent the axle from moving forward relatively to the rest of the vehicle. Two distance or radius rods are provided for this purpose and consist of tubes or solid members, the rear ends of which are attached to the axle and the forward portions secured to the frame of the machine, at points not far out of line with the front sprocket. These rods are made adjustable, and by loosening or tightening, the driving chain may be adjusted correspondingly, thus securing perfect alignment of the road wheels. Figs. 78 and 79 outline these distance rods and the manner of attachment.

The principle of the shaft drive is similar to that of the chain with live axle, the difference being in the method of transmitting the energy of the motor to the rear or driving axles. Instead of a sprocket wheel being fitted to the differential mechanism, a bevel gear is employed, although a variation is noted in the worm drive, described and illustrated herein.

The principle of the shaft drive is outlined at Fig. 74 which presents the chassis of a pleasure vehicle bisected squarely in the middle from top to bottom. It will be noted that power is transmitted through the clutch, thence through a universal joint and shaft to the transmission. A shaft of the latter is fitted with a bevel gear carrying teeth, the faces of which are cut in lines parallel to the direction of the shaft, upon which it is secured. Mounted with the differential is a larger gear or crown member with which the smaller pinion is in mesh. This arrangement is necessary when it is desired to connect by means of gears two shafts at right angles to each other; that is, the faces of the gear teeth are at an angle or bevel with the shafts upon which they operate, the sum of the angles of the tooth faces with their respective shafts being equal to the angle between the two shafts. The ratio of these gears is obtained by dividing the number of teeth on the larger member by the smaller pinion as with the chain drive.

Because of the slight variation in the distance from the point of attachment of the drive shaft to the speed changing mechanism, the point of contact of the two bevel gears changes slightly on account of the relative movement of the axle and car, and the shaft is provided with flexible joints. These members also serve to compensate the line of drive, and the amount of wear depends upon the drop; that is, how far below the level of the crankshaft is fitted the bevel or driving gear.

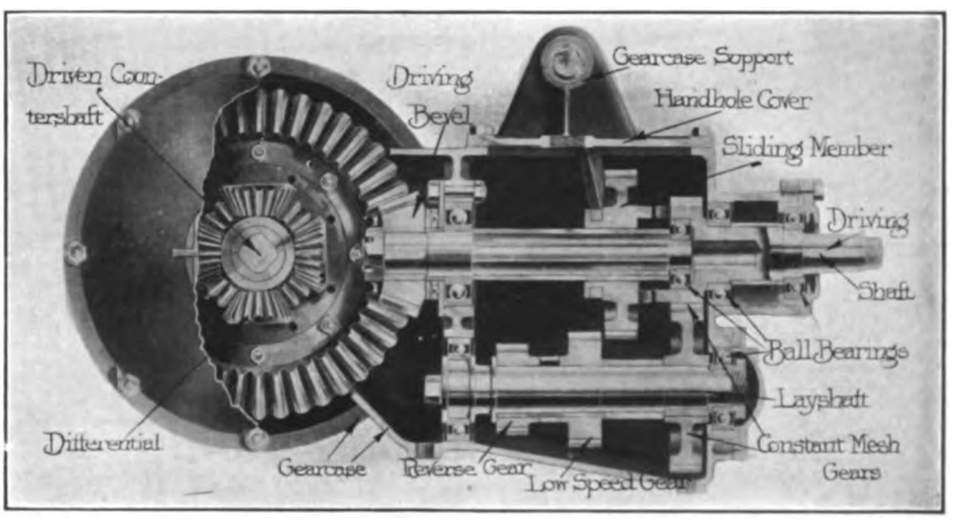


Fig. 76—Depicting the Differential and Transmission as a Unit, Also the Countershaft and Its Components.

When power is applied the tendency of the smaller gear

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is to force the drive shaft forward and to push that portion of the differential to which the larger gear is attached away from itself. To prevent this lost motion, thrust bearings

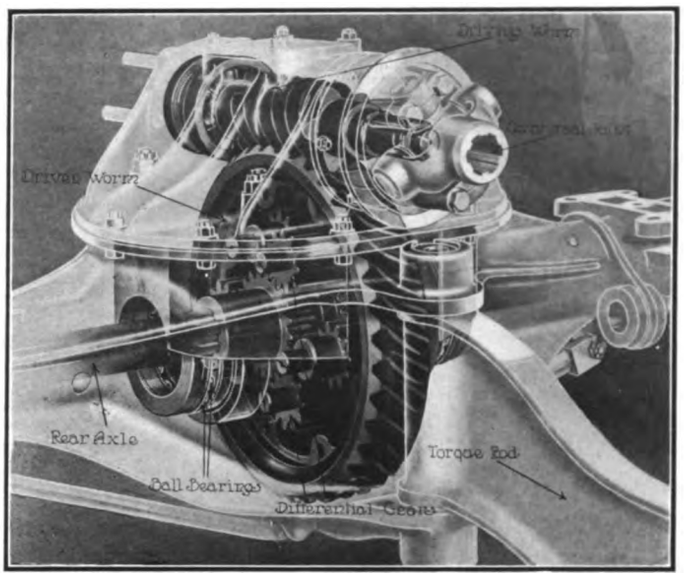


Fig. 77—The Worm Gear Drive, Having the Advantage of High Reduction with Small Sizes and Making for Quiet Running.

are fitted and these generally take the form of rows of steel balls, bearing upon hardened surfaces in such directions as to take care of the thrust. Ball or roller bearings are utilized to support the driving shaft which rotates in a hollow tube and provision also is made for the lubrication of the working parts. Radius or torsion members are fitted as with the chain drive system.

Various types of rear axles are utilized with the shaft drive and among these is what is known as the full floating type in which design the differential bearings are mounted on the hub of the differential instead of directly upon the shaft. The outer ends of the axle housing are so constructed as to permit of the mounting of bearings of sufficient capacity to support the weight of the vehicle through the medium of the driving wheels. This arrangement permits of the withdrawal of the axles or driving shafts without removing the wheels or jacking up the rear system. The road wheels are actuated by jaw clutches; that is, the outer end of each shaft is provided with jaws which mesh with recesses in the hubs of the road wheels. This design makes for easy inspection of the components and disassembling as well. There are other forms of floating types such as semi and three-quarter, also rear axles having bearings similar to that of the single chain drive with live axle previously referred to. With these types the wheel is secured to the driving axle which in turn is supported by bearings contained in the housing.

Worm Drive.

A method of final drive which differs from those of usual construction is the worm which is depicted at Fig. 77. This design is favored abroad and was adopted and successfully applied in this country, by a prominent maker of pleasure vehicles, to a commercial car.

The worm and gear has been utilized for many years in the steering system of automobiles and was supposed to be absolutely irreversible, a desirable feature when thus employed. The worm and gear, however, is constructed so as to be reversible and when substituted for bevel gears in a shaft drive with a live axle, has the advantages of high reduction with very small sizes, straight line drive, and the elimination of friction losses through universal joints. In addition, it has a reputation for quiet running. With the mechanical transport a greater reduction from engine speed is more desirable than with the pleasure vehicle, and the ratio of the gears in the illustration is approximately about eight to one. It will be noted that this design includes a torque rod for taking driving and braking strains, while the usual radius rods are fitted to relieve the springs of all tractive effect.

Internal Gear Drive.

Another form of drive and rear construction which may be said to embody the advantages of the solid rear axle utilized with the double chain, yet employs a differential and shaft as with the live axle, is the internal gear drive outlined at Fig. 79 A. It will be noted that the rear axle supporting the load is of the solid type and is turned down at the ends to form the wheel spindles to which are fitted roller bearings. Just inside of each spindle is a spider shaped casting which is utilized to support the differential axle, form the spring seats and provide a hub in which the radius rod is inserted.

The driving mechanism is depicted at B, this consisting of a housing carrying the differential and driving shafts and its operation is similar to the countershaft of the double chain drive with the exception that a spur pinion is fitted to either end instead of a sprocket. Each of these pinions meshes with a large internal gear bolted to the inside of the road wheels and the entire mechanism is enclosed and operates in grease, being dust and weather proof. The two radius rods unite toward the middle of the car in a single ball joint, which arrangement takes care of all stresses when operating over rough roads.

Function of the Brake.

With any mechanical conveyance it is essential that some means be provided for bringing the moving vehicle to a stop, and with the motor car this is accomplished by friction through stationary bands or shoes being brought

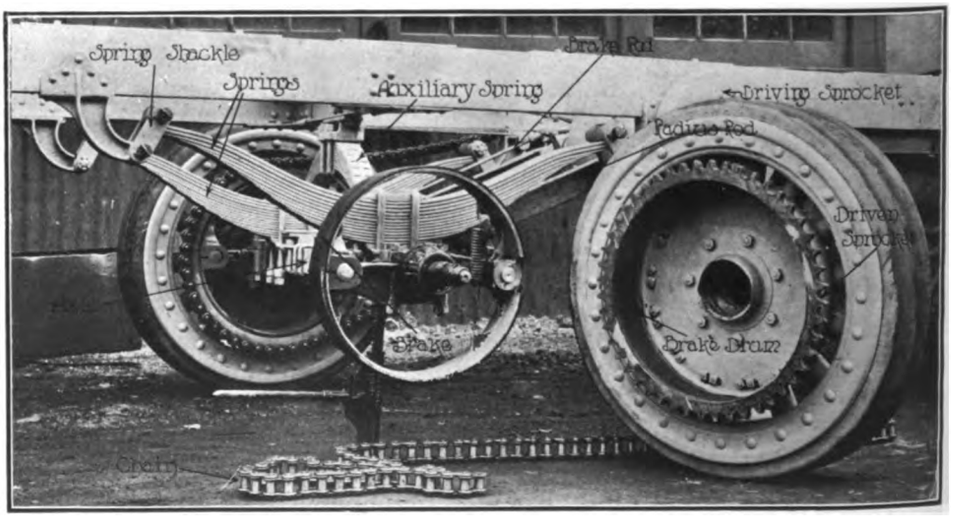


Fig. 78—Conventional Type of Solid Axle Utilized with Double Chain Drive, with Wheel Removed to Show Driven Sprocket, Axle and Brake.

into contact with some revolving part of its mechanism which is in motion at all times that the vehicle is running. Brakes are classified according to their construction as con-

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tracting band members or those of the internal expanding type, and they may act as hub, differential or transmission brakes.

The band brake consists of a strip of thin metal lined with frictional material and so arranged that its ends may be drawn together by means of a powerful toggle arrangement. This binding strap encircles a metal drum or pulley, attached to some part of the mechanism which moves when the car is in motion. When the band is contracted through the action of the toggle, which is operated by a pull rod in turn connected to a pedal or lever, the lining of the band grips the drum producing the desired friction. One of this type is outlined at Fig. 79.

The internal expanding brake, a form of which is depicted at Fig. 78, is favored because of its double acting qualities and the less liability to drag upon its drum. It consists of two semi-circular metal shoes, which conform to the inside surface of the wheel drum and are fitted with springs to prevent them from coming in contact with the drum when not in service. The members may be expanded by either a cam or toggle arrangement and when properly adjusted so as to provide an equal frictional effect are very dependable.

In order that an equal pressure may be exerted to both brakes a device known as an equalizer is incorporated, this member tending to divide the braking effect equally between the two wheels. Two sets of brakes are usually provided, one being the service member operated by pedal and an emergency actuated by a hand lever. These may be fitted with a locking device by which the brake may be held at any desired degree of pressure. The emergency brake may also include means for throwing out the clutch when the member is operated. With the commercial vehicle, transporting as it does, heavy loads it is imperative that the brakes be well designed and substantially constructed. The width is such that many square inches of braking surface are obtained, and provision is also made for taking up wear. Efficient members are equipped with springs which hold the bands in a normal position until pressure is applied, also preventing undue friction as well as wearing out the lining.

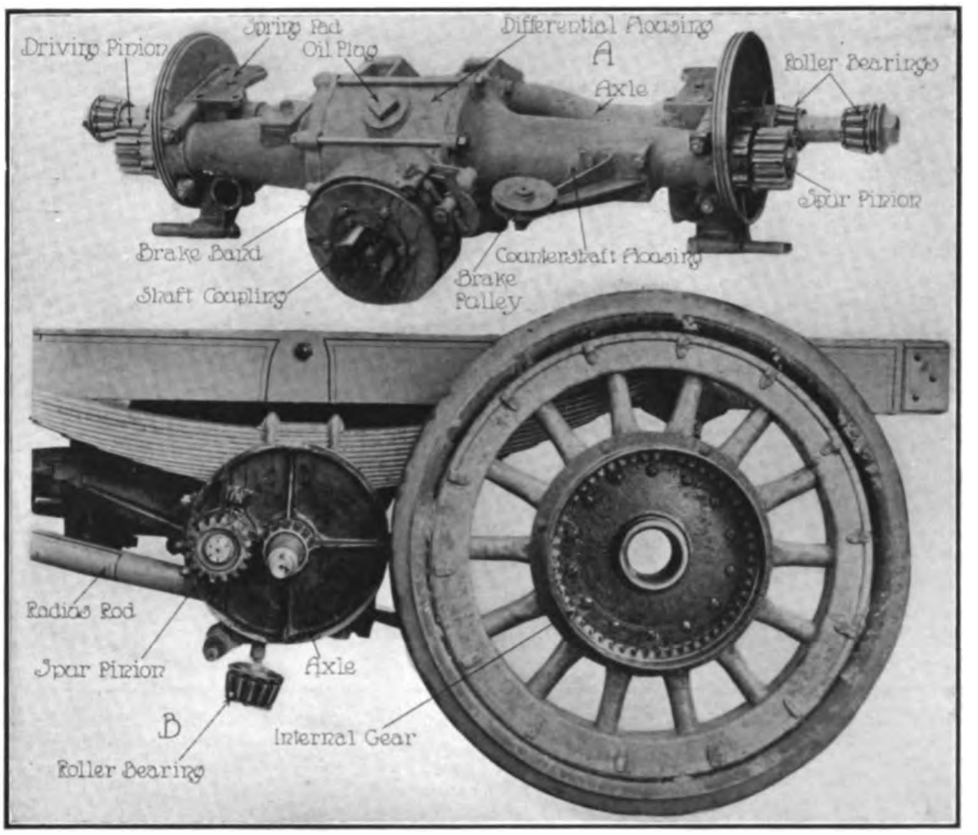


Fig. 79—Illustrating the Internal Gear Drive, Combining the Advantages of the Solid and Live Axles, the Former Carrying the Load.

(To Be Continued.)

Ed. Note—The next installment will deal with the function of the differential and the steering systems utilized.

NEW ENGLAND PURCHASES INCREASING.

The purchases of motor trucks in the New England States have increased rapidly in the past year and a half, according to William P. Kennedy in an address before the Electric Luncheon Club, Boston, recently. Mr. Kennedy gave some exceedingly interesting statistics. The trucks placed in service in New England up to Sept. 1, 1911, reached a value of $10,000,000, of which 30 per cent. had been placed in service during the preceding 12 months. The pleasure car total is three times this, or $30,000,000. According to Mr. Kennedy, the business of the six months from December last to March indicates that last year's record is to be exceeded by 50 per cent., and that there will be in operation in New England by Sept. 1, 1912, some $60,000,000 worth of vehicles.

DAILY ROAD PATROL.

In these days when motor transportation between cities is more dependent upon the roads than upon the trucks, any new road improvement scheme should prove of decided interest. The Middlesex Automobile Club of New Brunswick, N. J., has proposed a systematic daily examination of the highways in its vicinity. The idea is to establish a road patrol which shall go over every mile of the highway every day and correct at once minor faults before they grow larger. The club has appointed a committee to confer with the Board of Freeholders, and it is hoped that the two bodies will be able to co-operate in patrolling the roads. The expense will no doubt be large, but it should be remembered that there will be considerable saving in repair work, for the patrol will be able to work on bad spots as soon as they appear, before they grow so large as to necessitate extensive repairs.

ADVERTISING BY MAIS TRUCK.

A Mais, made by the Mais Motor Truck Company, Indianapolis, Ind., is to be used in an advertising scheme, and will go over the Premier ocean-to-ocean route from Indianapolis westward. Hugh Annis will be in charge of the expedition, and five men will constitute the crew. The truck will carry wireless apparatus, telegraph and telephone sets, a typewriter, and camping outfit.

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MOTIVE POWER FOR THE AVERAGE FARMER.

Solving the Problem of Furnishing a Satisfactory Vehicle That Not Only Will Do the the Ordinary Field Work, but Carry Loads on Its Own Body—Success That Has Accompanied the Use of the Avery Farm Trucks.

CAN the average farmer, the man with 500 or 600 acres of land, utilize a gasoline truck to advantage in undertaking his general field work? That the larger tractors have been accomplishing splendid results on the farms containing thousands of acres on the broad prairies of the West and in Canada, is more or less well known, but there appears to be a lack of information concerning the vehicle which is adapted for similar usefulness on the so-called small farm. Undoubtedly, there are numerous questions which must be given careful consideration before the horse is entirely abandoned, but at least one manufacturer, the Avery Company, Peoria, Ill., claims to have reached a decidedly satisfactory solution to all these problems in its Avery farm truck.

The argument against the horse may be summed up as follows: It costs too much to feed, it takes too many men to operate, it takes too long to do the work, it is subject to weather conditions, diseases and accidents, and it takes up too much time in care and attention.

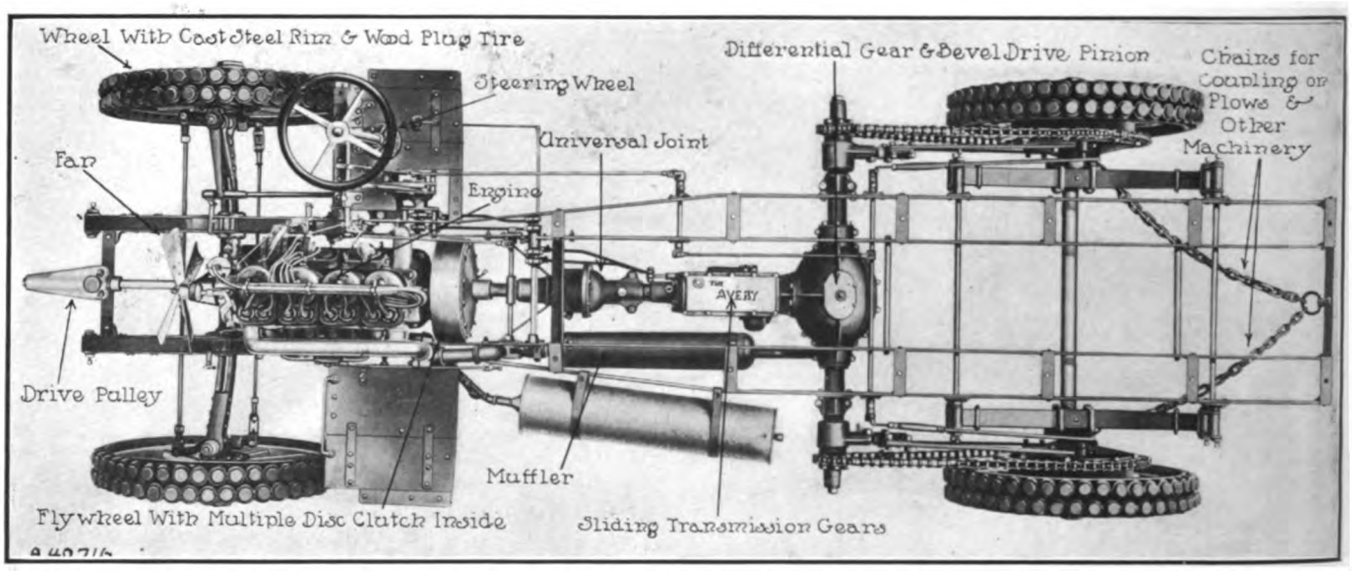
It is maintained that it takes the crop from one acre in five to feed the horses necessary to do the work. The Minnesota Agricultural Experiment Station has discovered that the average annual cost of maintaining the average farm work horse is $80, and for this cost, the animal gives a return in work averaging about three hours a day throughout the year, at a cost of about eight cents an hour on the average Minnesota farm.

One man can handle from two to four horses and do it right. It is becoming more and more difficult each year to hire good help, and each year the wages are increasing.

In order to make good profit from farming these days it is necessary to use up-to-date farming methods, which means that the farmer must plow quickly and to the required depth when the ground is in just the right condition, and that it must be cultivated several times over in order to make the best possible seed bed and to hold the moisture. It is an impossibility to go over the ground enough times and quickly enough with horses to raise as many bushels as must be raised to the acre.

Little need be said respecting the liability to accidents and disease, or the effect of weather conditions upon horses. In the matter of care and attention: At night, it is unhitch, unharness, water, feed and bed a lot of tired, sweaty horses. In the morning, it is feed, water, curry, harness up and hitch up. At noon, it is unhitch, water, feed and hitch up. Even when they are not at work, they must have care in order that they may be in condition when needed. And they must have the same care on Sundays and holidays.

More might be said concerning the drudgery of farm work, but the use of modern farm implements already has eliminated some of this. The present generation has seen the passing of the plodding oxen dragging the single plowshare across the field, while the farmer hit the hook a kick with his cowhide boot in order to turn it over at the end of the furrow. For a time the horse succeeded the ox in this work, but nowadays the farmer sits on a wheel plow and turns the shares with a lever. The introduction of the gasoline truck appears to be but another step in the onward march of progress.



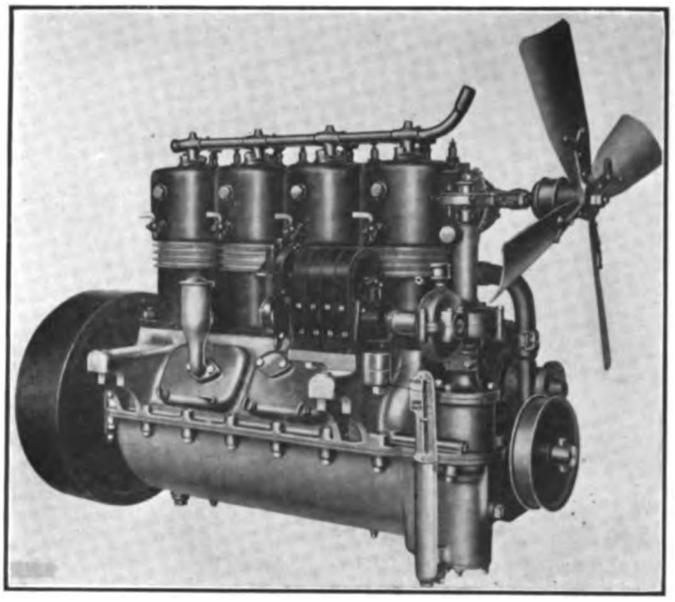
Chassis of Avery Farm Truck with Principal Parts Outlined to Indicate Their Position and Relation to Each Other.

The Avery Farm Truck.

The Avery farm truck is claimed to be the only machine designed and built for farm work, which will haul loads on its own body. It is the result of long experimentation, with the object in view of creating a power machine which will enable the farmer to do his work at less expense, at the right time, in the right way, and in a manner to relieve him of the troubles and faults of horse power. The method of meeting the various problems involved will appear with a description of the vehicle and citation of some of the work already accomplished by these machines in actual service.

For such work as is contemplated by a vehicle of this nature, it not only is essential that the motor shall deliver its power under unusual conditions when plowing and hauling, but it is particularly desirable that it shall operate at its maximum efficiency under load without heating while

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Avery Motor, Designed to Present Exceptional Cooling Facilities.

working as a stationary engine in sawing wood, threshing, etc. In this respect the designer of the Avery farm truck has lost no opportunity to provide for every possibility. Particular attention has been paid to the matter of cooling.

In the first place, the motor employed is a four-cylinder, four-cycle, water-cooled unit of the vertical type, placed forward under a hood and easily accessible. The bore is 4.75 inches and the stroke five, giving a horsepower of 45 under a brake test. However, the machine is rated at 12 horsepower in tractive effort for pulling loads, and it is held to be possible to obtain any speed from two to 15 miles an hour.

Provisions for Cooling.

The cylinders are of the L head type cast separately and with their entire surface exposed, permitting equal expansion and contraction of the metal on all sides. Liberal water jackets have been supplied, and petcocks are provided at the lowest points, as also is true of the radiator and pump, so that all of the water may be drained from the entire system, should it be found desirable to put the truck up for the night without resorting to the use of an anti-freezing solution before cold weather actually begins.

An additional feature in the cylinder construction is the utilization of four radiating fins below the water jacketing on each member, these providing for supplemental cooling somewhat on the principle of the air-cooled motor. Thus, not only is the combustion chamber thoroughly cooled by water but that portion of the cylinder below also is maintained at a proper temperature by these radiating fins.

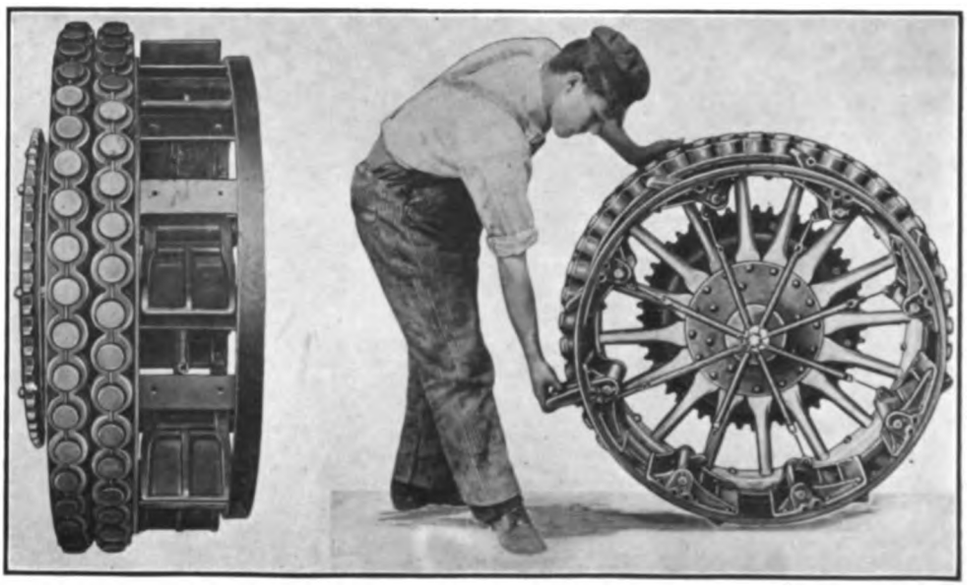
It is claimed by the company that its cooling system will keep the motor cool even when the truck is being used in the severest work. This comprises a honeycomb radiator of large capacity, placed in an upright position in front of the motor, and a fan just behind this. A positive gear pump keeps the water in circulation, even when the engine is running at a low rate of speed. Nine gallons of water are thus forced through the manifold, entering the cylinders near the valves, so that the coolest water strikes the hottest part of the cylinders first. In connection with this, the fan is driven by a one-inch belt from a pulley, and means are provided for automatically adjusting the tension.

Motor Construction.

Inasmuch as the moving parts of the power plant are subjected to stresses not usually encountered even with commercial vehicles, special effort has been made to insure that these shall be retained in perfect alignment at all times. The crankshaft, for instance, is a drop forging, accurately turned and trued, and fitted with five bearings, the object being to hold it in position under the most severe strains. The same thing applies to the camshaft, also a drop forging with integral cams. After forging, this is machined and hardened, then reground to prevent the possibility of using a shaft which might have been drawn out of alignment during the hardening process. The connecting rods are steel forgings, each having large bearings at both ends.

All valves are accurately ground and are of the adjustable type, this being accomplished by a lock nut arrangement. The motor is fitted with so-called clean-out plugs at the top of each cylinder, by turning which with an ordinary wrench, it is possible to loosen and remove any carbon deposit with a small instrument and without dismantling the motor. In addition, each cylinder is provided with a priming cup, making it unnecessary to remove any of the spark plugs should priming be necessary in cold weather, and liberal inspection plates are fitted to the upper half of the crankcase. Thus the designer has taken into consideration that the truck may be placed in the hands of those unaccustomed to working upon the automobile power plant and the labor incidental to proper care has been reduced to a minimum.

Simplicity is combined with sturdy construction throughout. The lubrication is by a combination force feed and splash system in which all the operator needs to do is to pour in the oil. Below the crankcase is a sub-tank or sump, into which the oil is poured, and from which it is constantly forced through a .5-inch pipe perforated along its sides, by a positive gear pump. This pipe sprays lubricant onto cranks and bearings and into the cylinder casings. The cranks also dip into the lower crankcase and aid in the distribution to all working parts. The constant level is maintained in this lower crankcase, the overflow running into the sump. An



Two Views of Avery Wood Plug Tire and Wheel Extension, Illustrating Method of Bringing Lugs into Action.

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William Larson Utilizes Avery Farm Truck to Pull Three 14-Inch Plows at the Rate of 10 Acres a Day on Short Land.

oil gauge permits the driver to determine the exact level at a glance.

Two sets of spark plugs are fitted, ignition being by a double system, employing a magneto and storage battery. The company calls attention to a feature of this system, by which it is possible to connect either the battery or magneto readily with either set of plugs, so that it is never necessary to run the engine with one or more cylinders missing, even though the battery may be weak and the magneto plugs are not working properly. The gasoline capacity is 23 gallons.

Clutch and Transmission.

The clutch is a multiple disc member of the Avery Company's own design and manufacture. It consists of 13 discs, six of which are of 13 inches diameter and the other seven a trifle smaller. These are contained within the flywheel and run in oil, this not only acting as a lubricant but serving as a cushion and causing easy engagement and release.

The transmission is of the selective sliding gear type, simple in construction and silent in operation. The design is such as to provide three speeds forward and reverse, these changes in speed being effected with ease. The extra large gears are made of special alloy steel, accurately cut and tested for hardness. These operate on Timken roller bearings, which reduce friction to a minimum. Between the clutch and transmission is a universal joint of ample size, housed in a dust proof casing and running in oil. This aids in keeping the main components of the generation and transmission of power in exact alignment under the most severe conditions of service.

The countershaft is large, running on Timken roller bearings. The bevel drive gears also are extra large to meet the requirements of their work and are made of the very best alloy steel. Every gear is accurately cut and tested for hardness before being assembled. They are housed oil tight and dust proof, and it is claimed that hard service will disclose no appreciable wear except a brightened tooth.

Final drive is by double side chains to the rear axle, which is 2.75 inches in diameter. The drive sprockets are fitted with 13, 17 or 20 teeth in front and 51 or 58 in the rear, although any combination which will best suit the work can be furnished, and extra sets are supplied without charge. These are made interchangeable, as also is true of all parts throughout.

In a vehicle of this nature it is absolutely necessary to provide efficient brakes, which shall be capable of holding the truck on the steepest grade or for exceptionally quick stopping, the latter being particularly true when engaged in plowing land in which stones or stumps are liable to be present. Each rear wheel and each end of the countershaft is provided with an internal brake of the expanding band type. Those on the wheels are 16 inches in diameter and have three-inch faces, while those on the countershaft have diameter of 12 inches and faces of two. The wheel brake shoes are held by double radius bars extending to the countershaft, and thus the strain of stopping the truck comes on these radius rods rather than on the rear axle and springs.

Brakes, Frame and Springs.

The frame is composed of four five-inch steel plates, with cast steel spread blocks between each pair of plates, all riveted together, making a strong and rigid, though flexible assembly. An accompanying illustration shows plainly the general construction of the framework and the location of the working parts. It will be noted that the



J. F. Sweany of Stafford, Kan., Shelled 800 Bushels of Corn, Employing His Avery Farm Truck as a Stationary Engine.

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front is narrowed, which permits of a wide swing of the front wheels and makes possible short turns, such as are required in plowing, etc. A double rod connects the steering arms, one in front of the axle and one behind, this construction being for the purpose of preventing accident in case one arm or one rod should become broken. The steering gear is of the standard automobile design, and offers no complications for the inexperienced operator.

The entire load, motor, transmission and frame, is carried on strong leaf springs, those in the rear having 13 leaves three inches wide, and those in front having 11, 2.5 inches wide. Wheels are 41.5 inches in diameter. The wheelbase is 140 inches and the tread 62. The regular bed is of hard wood, 52 inches wide and 123 inches long. The carrying capacity is three tons, and the net weight with platform and 20-inch box is 5875 pounds. Special bodies may be fitted upon order.

Novel Wheel Equipment.

A particular feature of construction is to be found in the tires. The wheel rim is of cast steel, perforated and filled with two-inch round hard wood plugs, driven in securely. These plugs are placed diagonally across the face of the rim and form a smooth surface, the steel rims and wood plugs providing the necessary grip for travelling over soft plowed ground or muddy roads. It also is claimed that they run over hard roads, macadam surfaces or paved streets without injuring them in any manner. The plugs will wear for a long time when travelling over ordinary dirt roads or in the field, and can readily be driven out and replaced at small expense, when it is necessary to renew them. The wheels may be furnished with one, two or three rows of plugs, as desired.

Besides the special construction of the wheel itself, an automatic extension is provided for each of the rear wheels, this being designed for use when the fields are exceptionally soft or the roads are very muddy. Each consists of two wrought iron bars between which are heavy cast lugs eight inches in width. These lugs are mounted on pivots and the points are held below the surface of the wood plugs by means of springs. When the wheels travel over muddy roads or soft ground and sink so that the points of the lugs touch the ground, the revolution of the wheels causes the lugs to be extended vertically, 4.5 inches beyond the periphery of the wheel itself, forming a solid bearing surface against which to push. They are drawn back by the springs and return to their original position when not needed. It will be seen that their action is entirely automatic, coming into play the moment they are required and slipping back out of the way when their work has been accomplished. For such work as plowing or harrowing the lugs can be fastened permanently in an extended position if desired.

Plowing, Discing and Harrowing.

Accompanying illustrations present the Avery farm truck at work on so-called small farms, and indicate some of the many uses to which they may be put. Other instances will be cited, and while it is impossible to give a detailed comparison between the cost of these vehicles and that of horses, for the reason that farmers have not been given to keeping accurate account of such matters, it can be shown that one such truck will do the work of from six to 10 horses without difficulty and at a decided saving in expense.

One very pronounced difficulty comes to mind readily when considering the use of a truck of this nature in plowing. An accompanying illustration shows William Larson hauling three plows behind his Avery, and he says he can plow 10 acres a day, working on short land about 80 rods long. He adds that the truck keeps a straight furrow without being steered, and that the expense of plowing is confined to approximately two gallons of gasoline an acre.



Discing and Harrowing at the Same Time with Avery Farm Truck on Miller Bros.' Farm in Bliss, Okla.

But, granted that it is an easy matter to make the truck keep a straight furrow, how about the turns at the end of each furrow? Clayton Spratt of Auburn, N. D., plowed 150 acres with four 14-inch bottoms on old ground, averaging 11 or 12 acres a day with a fuel consumption of about two gallons to the acre. He also tried this equipment on some fresh sod, just to see if it would accomplish the work. The 150 acres were plowed on land of 25 acres, plowing six rounds and taking the plows out of the ground at the ends, after which they were not lifted again, as the machine was driven around the ends.

Miller Bros. of Bliss, Okla., estimates that its truck will do the work of eight horses in plowing, discing and harrowing. The machine shown herewith pulled three 14-inch bottoms with a harrow attached behind, and worked at the rate of an acre an hour. The photograph depicts it hauling two disc harrows with 14 discs to a harrow, and two drags, a load which would have required eight horses

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to draw. After the ground was prepared, the truck pulled two 12-hole disc drills, drilling in the seed, a work which it is claimed would have been heavy for 10 horses.

An All Around Machine.

Apparently, Harvey Shippy of Chapman, Kan., found one piece of work which he could not do to advantage with the truck, that of plowing or cultivating corn. He employed four horses for this job, doubtless because he has not yet found a way to run the vehicle over the rows without crushing the tops. However, it did all the rest of the work on his 400-acre farm, including plowing, discing and harrowing, 130 acres of which was cared for in the fall, cutting 125 acres of wheat, running a four-roll shredder, shredding corn, hauling sand, grading eight miles of road, in the last named work getting close up to the hedges where it was impossible to go with horses. The expense for the year was limited to oil and gasoline and one set of little boxes. The fuel bill totaled $99, which he says is ever so much cheaper than hay and feed.

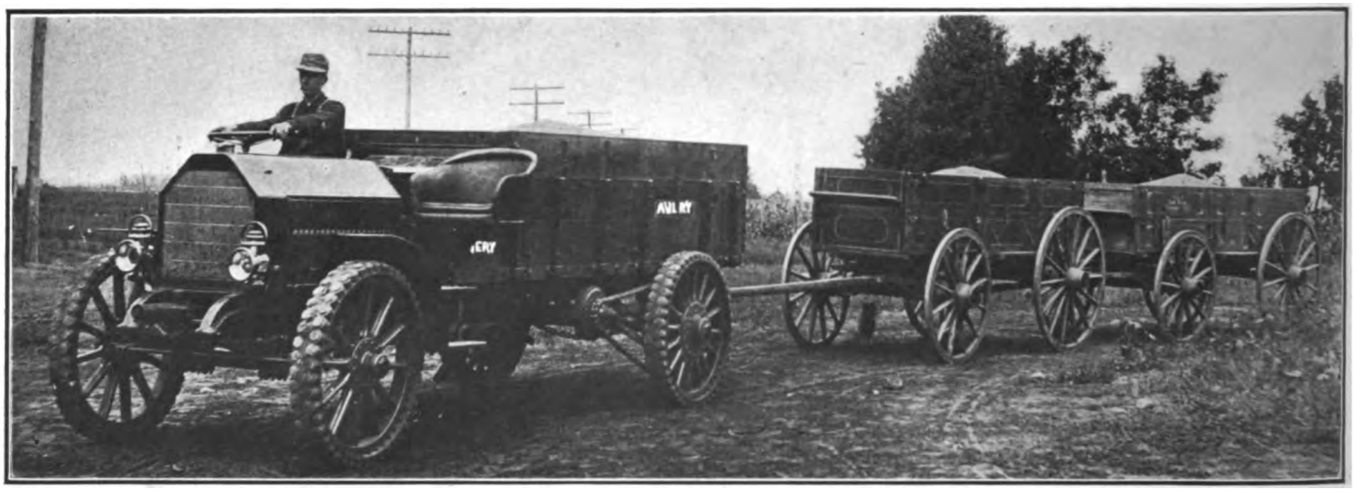
In the chassis view, herewith, the pulley at the front is for the purpose of attaching a belt for use as a power machine of all sorts. J. F. Sweany of Stafford, Kan., shelled 800 bushels of corn with the truck shown in an accompanying illustration, without stopping and with a trial start at that. He says he had enough power to operate the six-hole sheller and plenty of reserve.

After plowing with three 14-inch bottoms in a field of 80 acres against three three-horse teams, each pulling a 16-inch plow, in which work he turned over 50 acres while the horses were turning over 30, and using his machine for all sorts of work throughout the summer, J. A. Waltner of Freeman, S. D., loaded the truck and two horse wagons as trailers with 198 bushels of wheat. The camera caught him on the way to market, on which trip he drove at the rate of six miles in 57 minutes. Using these same two wagons in the same manner, he carted seven tons of hay to the baler at a trip. After baling the hay, he put 70 bales on the truck, loaded the two wagons with 4.5 tons more and hauled this load a distance of 20 miles, most of the journey on the high gear. He says he finds the machine more convenient to handle around the farm than horses, particularly as it is ready to go at an instant's notice.

Ashton Rollins of Three Rivers Farm, Dover, N. H., uses his Avery truck to haul lumber, potatoes, apples, etc. During the late summer and fall he cut silage and run a small saw mill, taking day work among the neighbors. He also did all the plowing and harrowing on his farm.

E. W. Parsons of Jennings, Kan., says he can do the work of three four-horse teams with an additional saving of at least one man. His work is principally that of covering an oil route, averaging eight trips in six days, five of them of 40 miles, one of 32 and two of 20. The average expense of the 40-mile trip for oil and gasoline is $1.40.

Thus is presented the argument for the Avery farm truck. It is an all around power machine. It will haul loads on its own body as well as in trailers. It will do the plowing and field work, and all kinds of belt work. It will do the work of from six to 10 horses, and it costs less for gasoline to run it than to feed the horses necessary to do the same work. It saves money besides being easier to take care of and handle. It saves the expense of keeping surplus horses for use only in rush seasons. It doesn't eat anything when not at work. It requires one-tenth of the storage space necessary for horses and the hay, corn and oats they must eat. It is possible to do the work when it should be done regardless of weather conditions. It makes for larger crops by doing the work right. It will haul a load in from one-third to one-half the time required by horses, and even faster if necessary. It will work as many hours as needed, and when the work is done it is simply backed into the shed, the switch is turned off and the labor is ended. It doesn't have to be cared for at regular hours on Sundays and holidays. It is ready for work instantly. It is possible to start right in at work the first thing in the spring, without waiting to get seasoned. It is easier to handle, and backs up quicker and just where it is desired to go.



J. A. Waltner of Freeman, S. D., Hauling 198 Bushels of Wheat to Market with Avery Farm Truck and Two Horse Wagons as Trailers.

SCIENTIFIC HAULAGE COSTS.

More and more firms are beginning to appreciate the need for scientific analysis of their haulage costs, an indication of which may be seen in the fact that the American Locomotive Company's transportation cost bureau was recently called upon for such analysis by 102 large concerns in 37 different industries.

WOMEN TAXI DRIVERS.

Taxicab operators who have been troubled with dishonesty and inefficiency among their drivers will no doubt watch with interest the experiment of a Chicago taxicab company, which has hired 20 women as chauffeurs. The company expects that the new recruits will be more honest, careful and respectful to patrons. While the change is so far only an experiment, abroad women taxi drivers have been thoroughly successful, Paris having found them to be as good as the men, and better in some respects.

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UNITED STATES ARMY FIELD WAGONS.

SOME little surprise will no doubt be occasioned by the statement that the government has taken steps to obtain from commercial car manufacturers reports of the sale of each machine, with the address of the purchaser and the size and power of the vehicle. An impression exists that this country is far behind the European powers in its preparation for utilizing motor trucks in military operations, but according to Capt. Alexander E. Williams, 19th Infantry, U. S. A., writing in the Infantry Journal, the United States has gone further than any foreign country in its experiments with automobile transportation for the army.

A large number of experiments has been made in all parts of the country, employing trucks under all conditions and for many various uses. Details of these have naturally been kept somewhat private, and comparatively few particulars have reached the public, with the exception of where purchases by the government are used as a basis for advertisement by the manufacturers. Besides the information obtained in these tests, the War Department has detailed information of the number of trucks being manufactured and sold in this country, with the mechanical features of the various makes. All this data, coupled with the records of the sales of machines, will give the government definite information for use in case of war, and will prove invaluable. Besides being able to select the machines best suited for war purposes, the sales records will show the capacity of each factory, enabling emergency rush orders to be placed where they will be filled quickest.

That no misapprehension as to the field of the motor truck exists in the War Department is made clear by Capt. Williams' article. The service for which they are desired is to transport supplies from what is called the rail head, the terminus of the railroad nearest the field of operations, to the field. It is not expected that the trucks can go across country to the actual camps, which may be far from a road. For this work, the regular mule transport system will be used, taking the supplies from the trucks on the nearest road.

Developing Field Truck.

The government hopes, however, to secure a machine that can take the place of the escort wagon and mules as a means of transportation for the troops in the field. This is seen in the fact that after considerable study of the situation, two special machines are being built to the War Department's specifications, one with chain drive and the other shaft driven. They will be of one and 1.5 tons capacity, respectively, and will be thoroughly tried out in all the work that a field wagon is called upon to perform. No details of the machines have been given out, but they will probably be light, with high wheels affording a big road clearance. While the road trucks will each replace several mule teams, it is not expected of the new field trucks that they will perform more than the work of one mule wagon.

Capt. Williams gives some very interesting figures comparing the costs of motor and mule transportation, showing the motor equipment would cost for fuel less than half what the mule would eat in oats and hay, and that the motors would take up on the road 22,596 feet, or over four miles, less than the mule train—a valuable consideration when trains have to be convoyed by troops in passing through a hostile country. The figures follow:

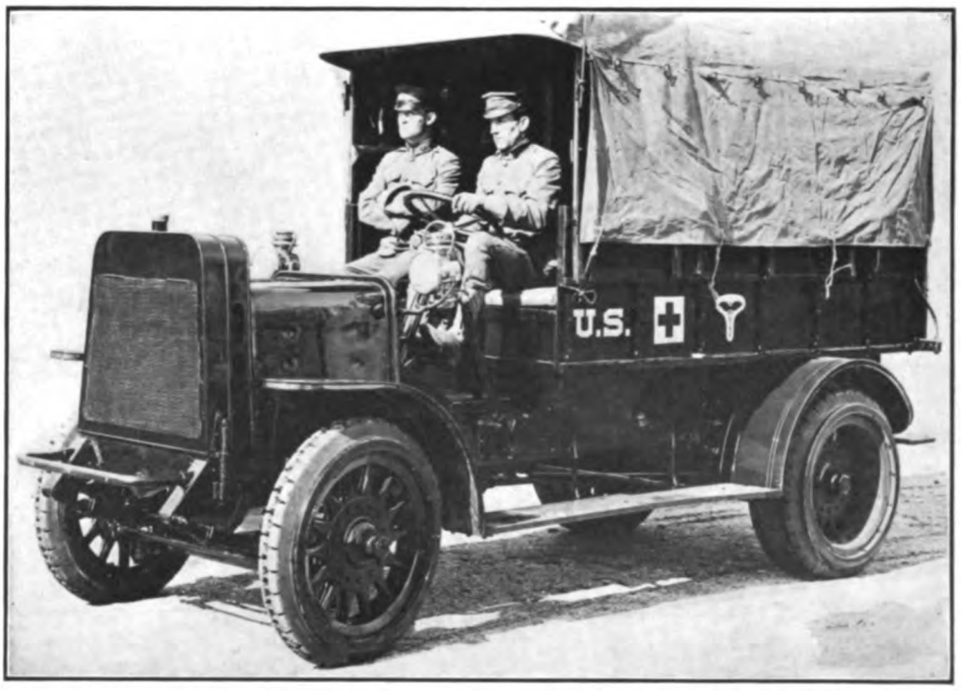
Forage for 3268 Mules for One Month:

	Weight, pounds	Space occupied, cubic feet	Cost
Oats	882,360	32,188	$14,770.70
Hay	1,172,560	114,380	10,170.67
Totals	2,054,920	146,508	$24,941.37

Gasoline for 807 Trucks for One Month:

Gallons	96,840	623,420	19,368	$12,105.00

Besides the saving of $12,836.37 presented here, there is a difference in weight of 1,431,500 pounds in favor of the fuel for the motors, and a saving in space of 127,200 cubic feet. It may thus be seen that the bulk of the gasoline would be less than one-seventh of that of the forage, which would mean, beside the saving in the cost of transportation, a great economy in the space required for storage at depots, an exceedingly valuable consideration in time of active operations. Also, the gasoline tanks on the trucks take no space from the loading platform, while the forage for the mule teams requires considerable room on the wagons.



Main Army Field Wagon Which Took Part in the Recent Test Run from Washington to Fort Benjamin Harrison, Indiana.

In an Emergency.

It is not contemplated that the government shall purchase a large number of trucks and hold them till war time, but a subsidy of privately owned machines of approved types is recommended. In case the new vehicles prove a success, somewhat of a problem is presented in the matter of rendering a supply available in time of war. It has been suggested that this military type of truck would be but little unsuited to use by private concerns, and that a substantial subsidy would induce purchases for business use and give the government a large fleet of machines from which to draw in an emergency. If there were no large

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privately owned fleet of machines available to the government, the only alternative would be to accumulate and store in various parts of the country a sufficient number of trucks to meet the requirements of an emergency. This would be much more expensive than a subsidy.

Either method appears expensive, but one or the other must be employed unless the government wishes to trust itself to the rather uncertain chance of acquiring machines of more or less suitability on short notice. In the past, the War Department has purchased mules immediately on the outbreak of hostilities, and has had little delay in fitting out the road trains, but if motors of a particular style must be depended upon, considerable difficulty will be experienced unless some provision be made, through subsidy, or otherwise, to secure machines in advance.

Of the two methods, the subsidy presents the more advantages. If the trucks were to be bought, when of no further use at the end of the war, they would have to be returned to the storage depots. But if secured under the subsidy scheme, at the end of the war the trucks would have a ready sale, and would realize their actual value, or could be returned to their original owners at a suitable price.

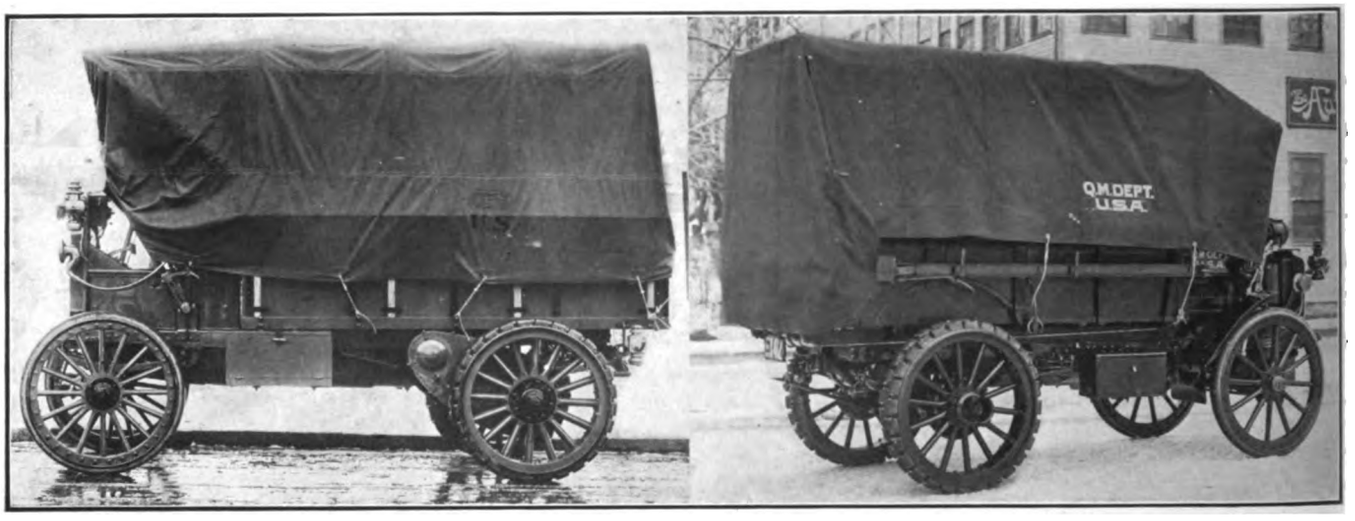
Just how far this country is ahead of European powers in the matter of motor truck transportation for the army may be seen in the statement of Capt. Williams that while the foreign countries have trucks for road use as here, they have not made any plans to develop a machine suitable for field use, and do not expect that any such machine will ever appear. This country not only has made plans, but has designed and is having built a machine which it is hoped will prove suitable for field service; if it does not, another attempt will be made.

This is quite in contrast to the view in England. In an article on the subject, Col. Paul, assistant director of transportation, British Army, stated that no mechanical vehicle exists at present which is trustworthy for supply train work, in distributing supplies over every kind of country off the roads, and that no suitable vehicle is to be expected in the near future. While the United States War Department agrees with Col. Paul on the first count, that there is no truck at present suitable for field work, it does not agree on the second, and is actively at work trying to develop a machine that will enable the supply train to be motorized. The government expects to take supplies from the rail head to the advance depot by ordinary trucks working over the roads, and from the advance depots to the troops in the field by means of specially designed machines capable of traversing almost any country.

While the recent road test conducted by the quartermaster department of the United States Army was concluded about April 1, no definite announcement has been made concerning the results obtained. The event was in the nature of a competitive run of 1509 miles, starting in Washington, D. C., thence to Atlanta, Ga., and through the South, and ending in Fort Benjamin Harrison, Ind. Five cars were entered as follows: Autocar, Autocar Company, Ardmore, Penn.; Four Wheel Drive, Four Wheel Drive Auto Company, Clintonville, Wis.; Mais, Mais Motor Truck Company, Indianapolis, Ind.; Sampson, Alden Sampson Manufacturing Company, Detroit, and White, White Company, Cleveland, O.

If it were the intention of the government to set a task almost impossible of accomplishement it succeeded remarkably well. The route, for nearly 1400 miles, led over roads deep with mud and filled with washouts after a severe winter, and in many of the mountainous sections wagon traffic had been abandoned, since horses and mules had been shot after breaking their legs in trying to extricate themselves from the quagmires. It was in every way the most strenuous test to which motor trucks have been subjected in this country. The complete details will be awaited with interest.

The vehicles were equipped as regulation army wagons, as the accompanying illustrations bring forth. Each was manned by a driver who thoroughly understood its construction, and a United States soldier, who watched its action throughout the run. These soldiers reported their findings to Capt. H. A. Hegeman, quartermaster department, Fort Benjamin Harrison, who will make known the result after its submission to his superiors.



Two of the Vehicles Which Completed the Recent Army Road Test: At Left, Sampson 1,5-Ton Truck; at Right, Autocar of Same Capacity.

Condition of the Roads.

The roads were in even worse condition than the army officials anticipated. From Washington to Richmond, Va., and until the North Carolina line was reached they were not difficult, despite the rough and ice covered spots. But once in North Carolina, it was all the cars could do to make headway at times. It was a frequent occurrence for a truck to drop into a hole up to the body, when it would be necessary to spend hours with block and tackle getting it out.

In many places the mountain roads were so steep and so coated with ice that it became necessary to spread branches of trees over the ground and chop a series of steps in the ice to facilitate traction. Near Jeffersonville, Ky., a stretch of mud was encountered which proved too deep for any of the trucks to navigate under their own power, and all were forced to utilize block and tackle applied to the telegraph poles, in order to extricate themselves.

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KISSELKAR TRANSPORTS ICE.

In transporting ice in warm climates it is essential that no time be lost in the hauling because of the possibility of shrinkage. The commercial vehicle is particularly adapted to this work, inasmuch as large quantities may be handled easily and hauled long distances in a very short time. The Kane & Trainor Ice Company, Stockton, Cal., a large dealer in this commodity, is utilizing the mechanical transport with success and in the accompanying illustration is depicted a truck fitted with a special body for the purpose of hauling ice.

The vehicle is the product of the Kissel Motor Car Company, Hartford, Wis., and is propelled by a four-cylinder, four-cycle, water-cooled motor. The clutch is a large cone of the adjustable type and power is transmitted through a selective type of sliding gear transmission, affording four speeds forward and reverse with direct drive upon third. Final drive is by side chains of ample dimensions. A feature of the rear system is the fitting of a differential lock, a device whereby the driving axles may be locked as one member, thereby facilitating traction when one rear wheel is in mud or on slippery ground. It also provides for an emergency drive in the event of a chain breaking, as the car could be propelled by the remaining member. The Kane & Trainor Ice Company is very much pleased with the truck, it having demonstrated its value, economy and power in the transportation of ice.



KisselKar Truck in Service with the Kane & Trainor Ice Company, Large Dealers in This Commodity at Stockton, Cal.

LYNN BUYS FOURTH TRUCK.

The city of Lynn recently took possession of its fourth municipal truck, this being a one-ton vehicle for the use of the street department. The commissioners are still considering the bids submitted for the police and fire department wagons, which were opened recently. The next purchase of this nature will be a vehicle for the use of the health department.

PELLETIER WITH UNIVERSAL.

In addition to his other duties as advertising director of the Studebaker Corporation and advertising manager of the Flanders Manufacturing Company, E. LeRoy Pelletier, well known in the industry, has joined the advertising staff of the Universal Motor Truck Company of Detroit. It will be remembered that W. E. Flanders, president of the E-M-F Company, now a constituent of the Studebaker Corporation, recently acquired an interest in the Universal company.

BRUSH AS VACUUM CLEANER.

A vacuum cleaner company in Indianapolis, Ind., recently equipped a Brush runabout, made by the Brush Runabout Company, Detroit, with some of its machinery for cleaning houses, etc., connecting the shaft to the regular driving shaft of the car by shifting the chains. As a result the automobile is utilized in hauling the cleaner to the scene of operations and takes the workmen along with it.

This Brush car has been working in this manner every day for a period of five months, during a greater portion of which time the working hours have been as high as 14 and 15 a day. No replacements have been found necessary and the owner considers that the test has been much more severe than would have been the case in ordinary driving over the roads.

Since noting the success the concern has had with this vacuum cleaning outfit, several other cleaning companies are planning to utilize cars in the same manner.

MOTZ TIRE EFFICIENCY.

The Motz Tire & Rubber Company, Akron, O., maker of Motz cushion and solid tires, is calling attention to its product and its effect upon the commercial vehicle industry in a neat little booklet of 24 pages, which will be sent free upon application. It is pointed out that when the tire expense is considered it will be found that the wheel equipment is one of the most important features in connection with the operation of a mechanical transport. The booklet sets forth numerous ways of bringing about tire efficiency and thereby reducing materially the cost of maintenance. It is fully illustrated and will prove a valuable treatise for those who are troubled with tire problems.

D. R. Linsley, formerly with the Pierce-Arrow Motor Car Company, Buffalo, N. Y., has joined the sales force of the Chase Motor Truck Company, Syracuse, N. Y., and will make his headquarters in the latter city.

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The MOTOR TRUCK
Devoted to Motor Driven Business Vehicles of All Classes.

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TAXING THE MOTOR TRUCK.

Automobile owners have submitted so long to the proposition of taxing their property for the cost of highway construction and maintenance, in which the entire public benefits, that perhaps it is not surprising that there should be effort to increase revenue by including the motor truck. However, there is a hopeful sign in the decision of certain motorists in Jackson, Mich., to test the constitutionality of the new law in that state. It also will be remembered that the New York State Automobile Association threatened to take the matter into the courts if the legislature persisted in its desire to enact more radical legislation on this subject there.

Massachusetts is setting a bad example with its latest bill to tax all automobiles, whether pleasure cars or trucks, on the horsepower basis. The industrial transport is a business proposition, and business men who may submit to conditions which concern their social life are prone to look upon matters which affect their business in a very different light. It may be that pressing the proposition too far will result in the discovery that the whole plan of taxing motor vehicles in this manner is class legislation, as many have suspected.

Chairman Charles Thaddeus Terry of the American Automobile Association has expressed the situation in the statement that motorists have submitted to this form of legislation only because of their interest in good roads. There is bound to come a time when they will no longer submit, particularly when the true economic value of the modern method of transportation is better understood and appreciated.

BUSINESS VALUE OF PARADES.

The second annual motor truck parade in New York City this month brought out an increase of nearly 100 per cent. in the number of vehicles in line. To those who have direct interest in the production and sales of industrial transports this has important significance, and the business man who carefully analyzes the situation will find much food for thought in this demonstration.

The day is gone by when concerns were purchasing and using commercial vehicles because of their advertising value. Every truck in service today represents a factor for economy and efficiency. Of course, by no means all the installations in the metropolis were represented, but undoubtedly the increase in number of vehicles on parade is a fair indication of the increased number in use.

This brings up the suggestion that there is decided value in these demonstrations; quite as much, if not more than in some form of competition. Other cities will follow the example of New York in holding similar parades throughout the year, and the practise should be extended even to the municipalities of the minor class. While these vehicles are in daily operation on the city streets, some organized attempt to call the attention of the business public to them will create a decided impression and set other business men to considering the possibilities for motor haulage for their individual needs.

THE LIGHT DELIVERY WAGON.

While the manufacturers of commercial vehicles have been seeking to develop a demand for their product with certain lines which require heavy duty machines, perhaps there has been a lack of interest in the small business, the needs of which are confined to the light delivery car. That there has been some appreciation of the possibilities along this line is evidenced by the number of such wagons which have made their appearance of late. Still, there is room for question as to whether or not sufficient attention has been paid to the requirements of the individual purchaser.

Special body designs are quite common, particularly with respect to the dumping wagons and so-called brewery trucks. There is quite as much reason for considering the small delivery business, however. It is conceded that a motor truck, no matter what its load carrying ability, develops its greatest efficiency only when worked to its capacity. Many small wagons could be utilized to advantage if it were possible to supply the carrying space so arranged as to provide for the exact requirements of the owner. This is a phase of the situation which is only just beginning to be given the attention it deserves, and there is much indication that it will receive careful thought and experimentation during the coming season.

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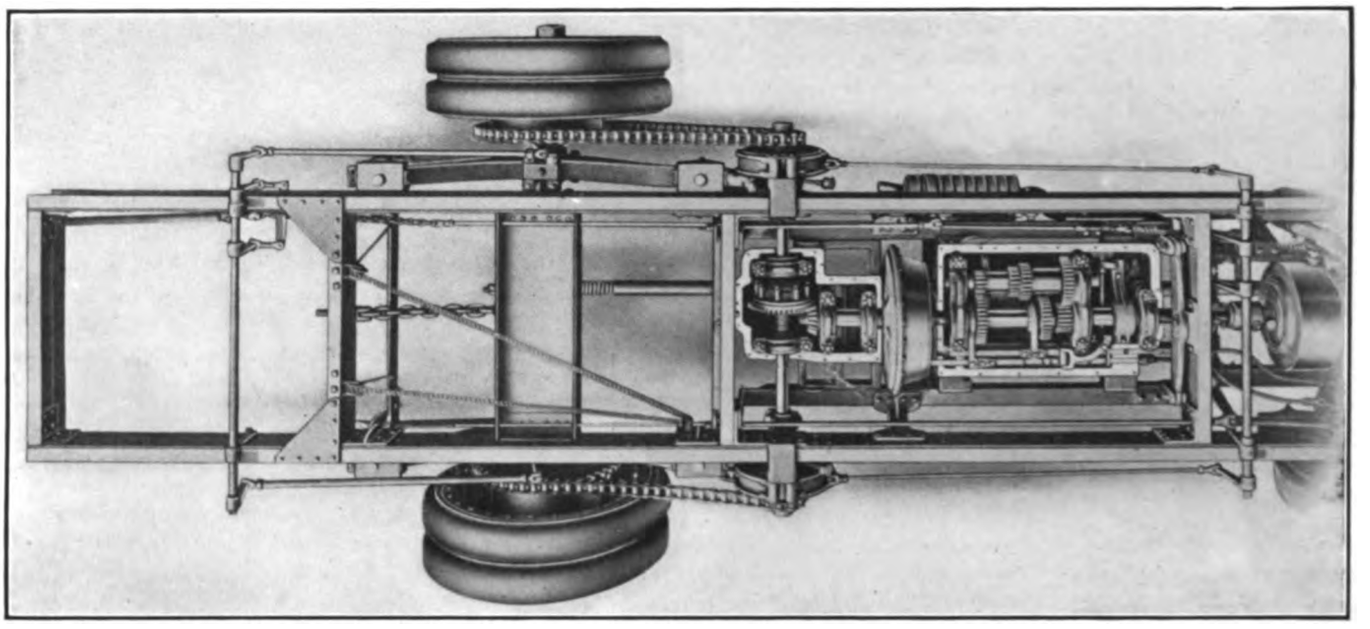
CHARACTERISTICS OF TRUCK DESIGN.

Developments in Construction That Have Eliminated Weaknesses and Made Possible More Uniformity of Strength and Greater Endurance of Chassis.

EVERY motor vehicle designer has sought to incorporate in his creations the desired elements of power and strength, and assumedly each man has satisfied himself that his conclusions are dependable, but with experience changes have been found desirable or necessary, often because of unexpected stresses and strains. No machine has been constructed that can be accepted as being absolutely without flaw. With some, faults will be more pronounced than with others, and when it is realized that the greatest strength of a construction is its weakest part there is the more need of studying every component and developing all so far as this may be done to a proportionate and harmonious whole.

This statement is made, not to condemn, but to justify changes and betterments in what may appear to be the unimportant details. In fact, there is nothing that is not necessary in a chassis, and from the smallest to the largest part each must be in correct relation to the other because all must endure, or should endure, the same length of time and under the most severe conditions of service. There is this fact to be considered in power wagons, that continuity of operation is imperative, and there can be no experiment made which will result in loss to the owner or reflect upon the maker. The mechanical transport is bought because it is tireless, and has speed and capacity that will save in time as compared with animals and minimize manual labor. Sentiment is out of place in business dealings and undoubted economy is the only logical reason for making investment. No man wants to take chances in business. He must be assured of improved delivery or haulage and insured against any possible delay. He cannot afford to make sacrifices. Once he is the victim of circumstances, not negligence or fault, he will lose confidence, and this reacts upon the maker of the vehicles that he owns or owned.

The designer of the power wagon has to deal with an entirely different proposition than the man who produces a pleasure car. He can take nothing for granted and he must know that what he has planned will work out in every detail with a certain margin of safety and endurance. The truck is often worked to an extreme by the driver or owner who believes that he is justified in loading beyond capacity, and driving to extreme speed, causing strains that are not possible with normal freights and operation. The responsibility for damage through overloading is generally shirked by the owner and driver, and pretense is made that the builder is at fault, because it is hoped that he will be either compelled or induced to assume the expense under a guarantee. There are limitations prescribed in every guaranty that are expected to protect the builder, just as the conditions afford protection to the owner, but the line of demarcation, if finely drawn, will often precipitate complications and perplexing situations.



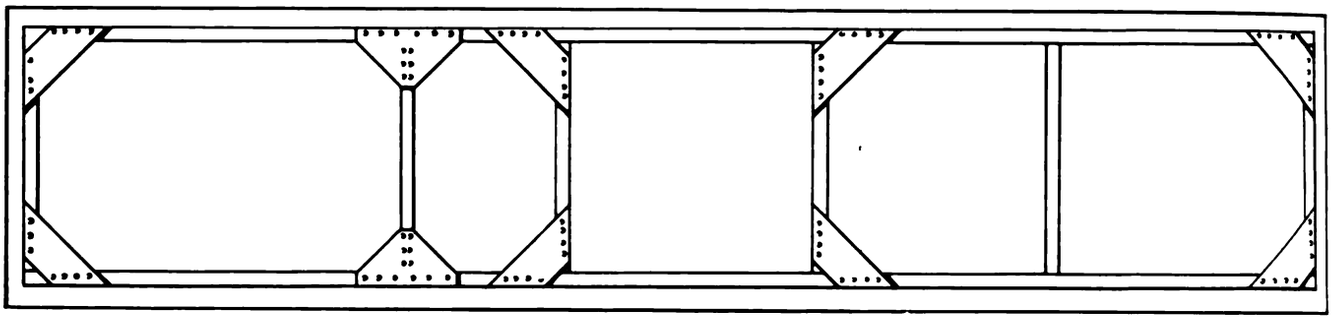
Top View of Eckhard Chassis Back of the First Clutch, Showing the Very Large Transmission, the Second Clutch, Differential, Sub-Frame Suspension, the Long Torsion Bar and Torsion Chain, All of These Being Features of Construction.

The manufacturer of vehicles must give his customers satisfaction because of the competition and the future. He realizes that he must make a guarantee that is liberal, largely to create confidence in his machine, and when this has been established it is necessary for the designer, so far as he can do so, to protect the builder against this guarantee. This being so the chassis must be studied for weaknesses and each element carefully observed through varying conditions of service. It may be that one part of seeming insignificance will be the keystone of the entire structure. Every other component may be adequate, and yet all are insufficient because of the failure of the one. It is possible that with the improvement of this element an entirely different character of service may be obtained. It may be a matter of workmanship alone. But whatever the cause it is necessary that it be eliminated.

Frames and Springs.

In the motor vehicles there is no more important part than the chassis frame. With rare exceptions these are of metal and usually the material is steel. Wood is sometimes

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Top View of Chassis Frame of Alco 6.5-Ton Truck Covered by the Body, Showing the Six Cross Members and the Reinforcement by the Large Gusset Plates.

employed and occasionally angle iron, but generally the members are channel section steel of differing grades, the form being determined to secure ample strength and the least weight. The members are formed of metal selected for its strength, which is often heat treated to insure this quality to the extreme. But with strength the next consideration is lightness, and while a frame may be strong the members may yield to varying strains. In the absence of temper that will resist distortion and conform to a certain shape the frame is expected to have a degree of elasticity that will protect it against stresses that might otherwise cause breakage. The frame members ought to be well assembled that there be no failure of the bolts and rivets, because wear will quickly develop at a rivet or bolt and the breaking of a single fastening will permit such excess distortion as to cause much damage to other members.

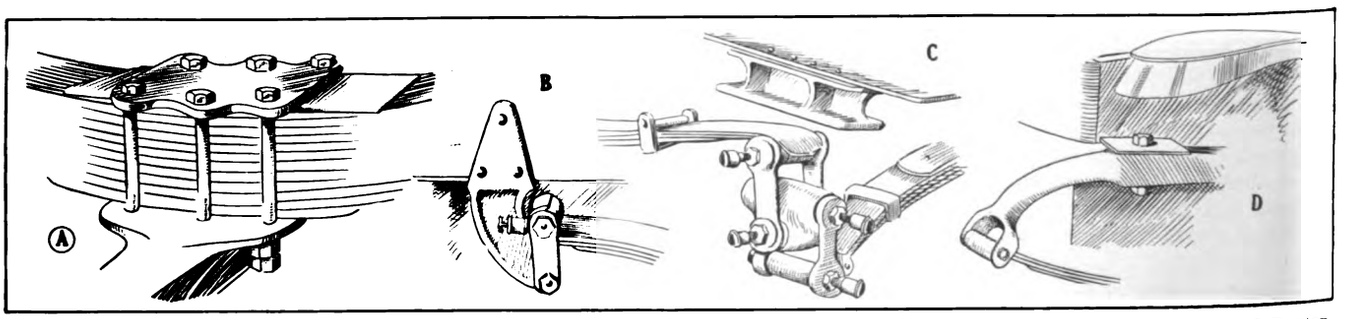
Every steel frame can be twisted. Complete rigidity would be ideal were it not impossible because of the great weight necessitated, and impractical because of the large proportion of power that would be required to propel it. The frame is supported by four or more springs that are assumed to protect it against excessive stresses and vibration, but the wheels always contact with the road surface and should one drop below the plane in which the others are moving the support of the frame by the spring carried by the wheel is lessened, and for a very brief interval there is an entirely different stress upon each member. This constantly changing condition of operation must eventually have effect upon the frame structure. The vibration results in metal fatigue, which is evidenced by breakage and can only be remedied by repair or restoration.

The frame is supported by the springs at either end and as the support of these is variable and as the shocks from road obstructions are transmitted through the springs, the greatest movement of the frame is at the ends and least at the centre. The most intense vibration is when the machine is driven unloaded, and the most stress is when driven loaded. As the motor is heavy and is carried forward it is often supported by a sub-frame attached to the chassis frame. The engine is expected to move with the chassis, but to avert leverage pressure upon the shaft universal joints are installed in the driving system. In several instances the power plant is made a unit and connection is to the cross members forward of the chassis centre. The drive is by shaft to the jackshaft located back of the centre, and by side chains. There are other forms of construction, but these are the exception.

Bracing the Assembly.

In the construction of the chassis frame the attention of designers has been directed toward bracing the assembly to minimize the twisting stresses and to secure so far as this may be practical a more general movement of the whole. The steel channel side members are connected by cross members of the same material. These are hot riveted in the best work and heavy gusset plates are used to brace the angles of the members against longitudinal or lateral movement. Theory would dictate that these gussets be proportioned to the frame, but that the same construction obtain with each. Opinions differ widely, however, and with the varying designs it will be noted that as a rule the number of gussets is increased with the size of the frame. This is especially noticeable with the Alco 6.5-ton chassis frame, in which every angle from the rear of the frame to the end of the platform space is braced. These gussets are usually placed at the top of the frame and seldom on the lower angles, there being evidently an assumption that sufficient strength is afforded with the single series of gussets. There is not, however, the same degree of rigidity that would be obtained with two sets of gussets. The example of the Alco is given as an illustration of advanced engineering with heavy trucks, and in connection with this is shown the manner of bracing the frame of the three-ton Pope-Hartford truck, in which the same practise is followed, but not as completely as with the larger Alco.

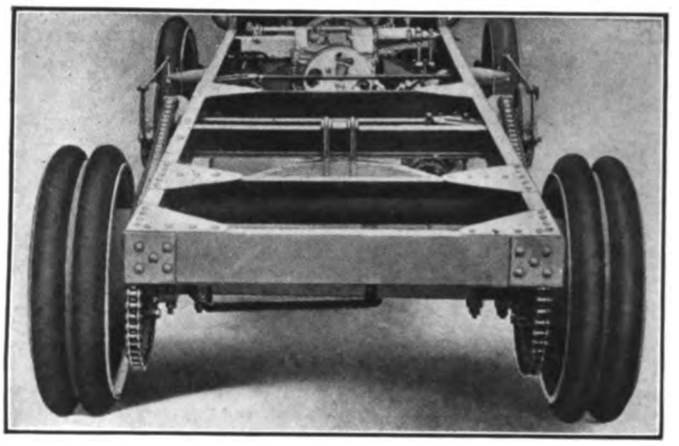
Few realize the driving stresses upon a truck frame because, under conditions usually obtaining, the drive is through the radius rods from the rear axle to the frame, and there is the influence of the thrust at either side, which cannot be equalized unless each wheel has the same traction and the differential is locked. With the radius rods fast to the axles there is resistance by the rods to the turning movement of the axles when the wheel brake is used, which lessens the strain upon the springs, but there is decided influence upon the frame because of the rods and the drag of the chains on the transmission unless the clutch be disengaged.



Some Examples of Spring Installation: A, Grabowsky Rear Spring Anchorage; B, Forward Hanger and Shackle of Dayton Rear Spring Construction; C, Barrel Shackles and Buffer of Grabowsky Platform Spring; D, Short, Heavy Spring Horn of Victor Truck.

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In the event of wear of the radius rods or their connections the stresses are partly taken by the springs, which are not constructed for such work, and the result is not



The Strongly Braced Load-Carrying Section of the Pope-Hartford Three-Ton Truck Chassis.

only destructive of the springs, their bolts, shackles, clips and hangers, but affects the chassis frame. The drive influence differs with the manner of loading. When a frame has sagged and been set out of line it will be understood that every other element is affected, provided that they are connected with the members. This applies to the levers and connections attached to the frame, to the shaft alignment, to the transmission, the jackshaft and its hangers, and to the radius rods and brakes, because there is lessened and excess movement as compared with the normal action.

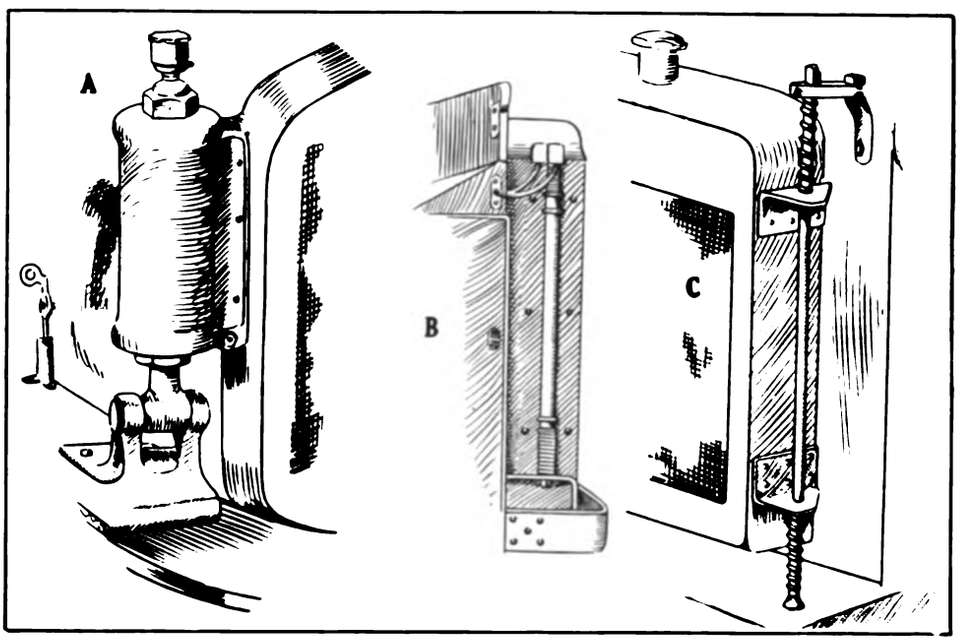
The frame, because of the reasons stated, is the keystone of the entire structure, and if it does not at all times maintain the elements of the truck in precise relation there is a certainty of abnormal wear and, perhaps, rapid deterioration. In the Eckhard chassis the designer has not only used conventional construction so far as the radius rods and springs are concerned, but he has provided a torsion rod that is connected with the front and rear axles and fitted with heavy spring buffers that relieve the radius rods of the upward forward thrust and applies a horizontal forward thrust from the rear axle to the front axle. This also lessens the strain on the forward springs and permits a more normal suspension by carrying the drive to the forward wheels and distributing the road shock stresses throughout to the heavy rear construction. This is an adaptation of the wagon perch for the maintenance of distance between wheels to the needs of the motor wagon. It is said that this works out exceedingly well in practise.

To minimize turning stress upon rear axle when wheel brakes are used, and good judgment would dictate that their use will nullify any strain upon the transmission, a torsion chain is employed. This is attached to the rear frame cross member and carried to a hook on the end of a vertical arm at the centre of the axle, and beyond a moderate stress upon the springs the chains restrains the twist of the axle.

The strain upon the rear spring saddles is at times extreme, and it often results in broken spring clips and a disabled machine. In the Grabowsky truck the spring clip has been eliminated and in its place is used a plate practically the same size as the saddle. This is drilled for six bolts, and two of these pass through the axle and the other four through the saddle, so that when all are tightened the spring is held much more solidly than with the ordinary clip. Should a bolt break it can be replaced without difculty, while a broken clip cannot always be readily obtained. The substantial work and the simplicity of construction are in every way commendable, and the increased strength is much to be desired.

With a majority of the designers the purpose is to protect the springs against wear and to accomplish this a longer member is used because of the lessening of the number of vibrations with increased length, and the decreased movement of the spring at the eye. Bronze eye bushings are the rule rather than the exception because of the longer wear with steel bolts than with the same metal contacting. And the value of lubricity at these bushings has led very generally to the use of grease cups. With all designs that which is simplest is best, and an example of both the practical and substantial is to be found in the forward hanger and shackle of the Dayton rear suspension. This is a steel drop forging of bracket type that is fitted under the frame member and is riveted to the side. The linkage is very simple and is easy to replace should there be wear or breakage. There is a very wide play for the spring.

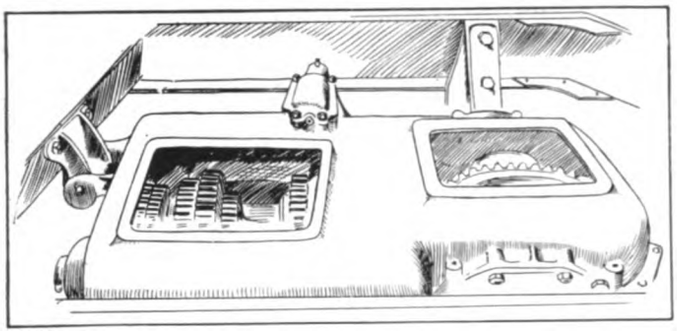
The construction of the Grabowsky platform spring is worthy of notice because of the linkage, which minimizes the wear upon the spring eyes and insures freedom of the spring action, together with a certainty of complete lubrication of every bolt and bushing, this making for long endurance. Each bearing part is fitted with a grease cup and this makes certain that there will be sufficient lubricity with minimum attention. Fitted to the under web of the frame side member is a metal pad that contacts with the side spring end when the truck is loaded. The weight of the frame and its equipment is normally carried on the lighter cross spring, but the load is always supported and steadied by the side springs, the end spring being constantly compressed to the point where the side springs take the full load. This is held to give the same results as with the use of the side springs and an auxiliary or jack spring. All



Details of Radiator Suspension: A, Shock Absorbing Cylinder Type of White Trucks; B, Rod and Bracket Support of Pope-Hartford Machines; C, Spring Mounting on Sanford Vehicles.

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the Grabowsky spring eyes are steel bushed. To make certain of the full clearance necessary with the springs without using a sharply curved member that would necessarily have excessive action, and to carry the front axle sufficiently forward to perch the springs on centre, some designers have used short and well curved horns that are integral with the chassis frame side members. It has been found where the springs are attached to the chassis frame end that this, with some designs, brings the wheels well back, a condition not conducive to easy handling because of the inability of the driver to see the wheels when seated above the motor.



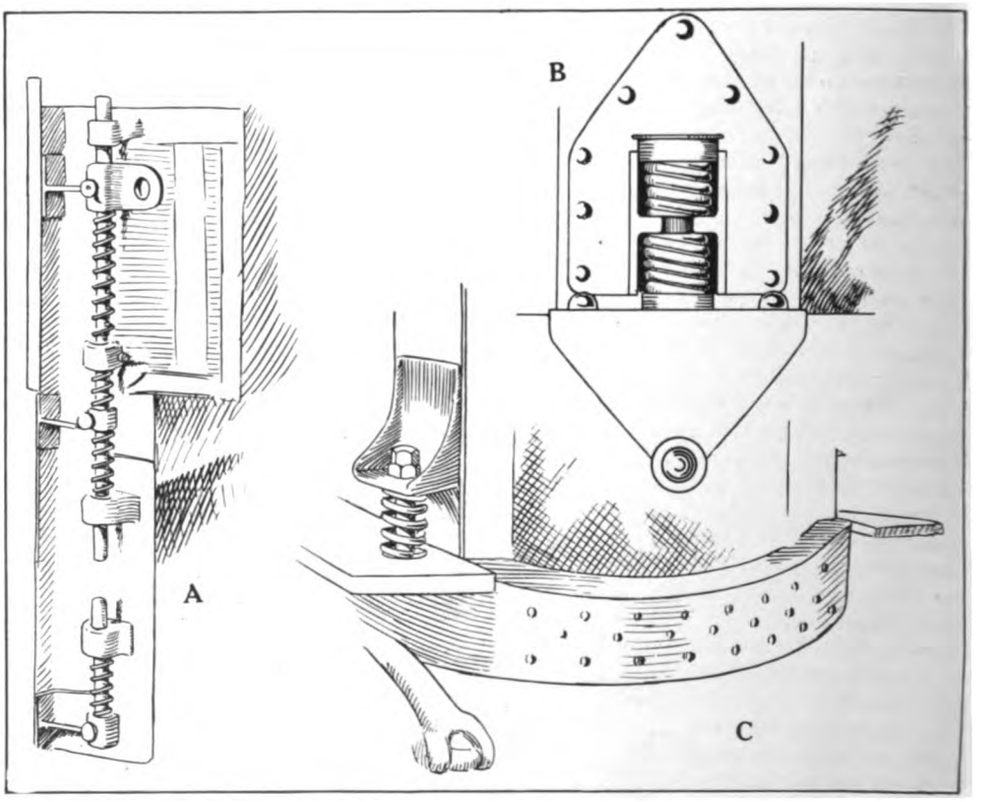
The Combined Transmission Case and Differential and Jackshaft Housing of the Locomobile Five-Ton Truck.

Transmission Design.

Realizing the stresses incidental to load carrying, designers have endeavored to guard against transmission failure by heavy constructions in the trucks of large capacity. In the Eckhard transmission the gearset is a separate assembly of such proportions as to cause surprise with those who observe it, for the shafts are seemingly enormous and the gears are proportionate in diameter and in face width. There is no question that they have unusual endurance and would probably withstand every strain that might be imposed. But to further insure against possibility of damage when changing gears there is a second cone clutch between the transmission and the differential, which is disengaged with the clutch between the engine and the transmission, and a brake applied brings the gearset to a full stop before the ratio desired can be engaged. The gear teeth are coned so as to make possible engagement when the gears are idle and to minimize wear. If the clutch be disengaged and the machine moving, the gearset is stopped instantly when desired and every possibility of damage to the transmission is eliminated. The shaft bearings of the gearset are large and should endure under every possible condition of use. The transmission case is suspended at the front end by links at the ends of the arms of a broad yoke pivoted on the heavy cross member of the sub-frame, and is carried at the rear on a sub-frame cross member, so that, with the universal joint in the clutch shaft ahead of the transmission, there is small probability of misalignment of the driving system.

The Locomobile transmission case is in combination with the differential housing and is a unit of unusual size. It appears to occupy a great deal of the space in the chassis frame and have weight that would seem unnecessary, but while it is a gearset that might be expected in a machine of much greater capacity examination of the gears and shafts shows that these should endure as long as any element of the truck. The case is bronze and very strong. It has two openings, one over the gearset and the other above the differential. The transmission shaft and countershaft are side by side and the gears and their condition can be determined almost at a glance. The differential is a continuation of the case and at either side is bolted the steel housings for the jackshafts, these containing the roller bearings close to the differential and the annular ball bearings at the outer ends. The housing of the jackshaft is mounted on spherical bearings in cast steel brackets attached to the frame side members, so that the alignment of the jackshaft is not affected by the distortions of the frame, and the forward end of the transmission case is suspended by a bolt that passes through a yoke on the frame cross member and a lug at the end of the transmission case. The bottom of the transmission case is of aluminum and this may be removed, in much the same manner as the bottom of an engine case, for work on the shafts, bearings and gears.

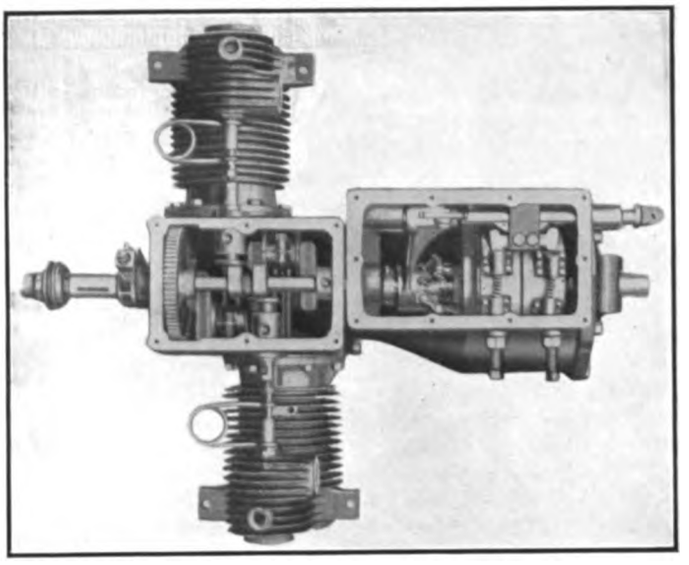
The case and the driving assembly need not be affected in any manner by the weight of a load or road shock and there is as near a three point suspension of the gearset and jackshaft as may be found in any form of construction, there being a larger degree of vertical movement possible than would ever be necessary in so short a section of the chassis, and there is a reasonable degree of motion permitted by the jackshaft mounting. The upper section of transmission case carries the gearset and by dropping the lower part the clutch pinion, countershaft or main shaft may be removed without disturbing any other components, these all being attached to the case by collars. This transmission has four forward speeds and reverse, and the gears are with 1.5-inch face, of heat treated alloy steel, and cut



Details of Radiator Suspension: A, Combination Spring Support of Cooler and Gasoline Tank in Sandusky Wagons; B, Neat and Substantial Federal Mounting; C, Victor Simplicity and Protection by Perforated Frame Cross Member.

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on a gear shaper to insure an accuracy that will minimize frictional losses. The countershaft gears are bolted to the faces of flanges, cut from the solid metal forming the shaft.

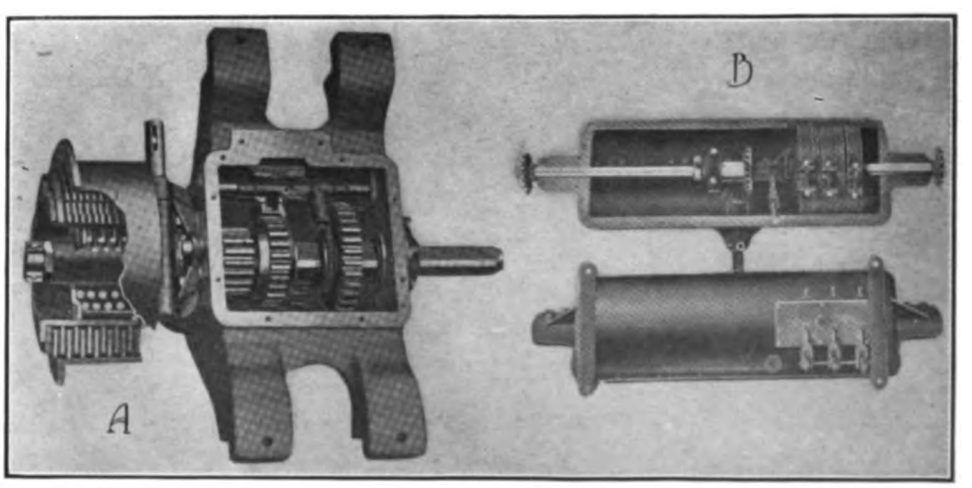


The Unit Power Plant of the Mercury Delivery Wagon, an Opposed Cylinder Engine and Planetary Gearset.

With the Grabowsky design the transmission and the clutch are practically one assembly, the clutch being a dry multiple disc creation with seven driving and six driven discs. There is no universal joint between the two and the clutch is carried between the rear bearing of the engine and the forward bearing of the transmission. A sliding transverse bar operates the clutch, the thrust being taken by the thrust bearing ahead of the forward transmission bearing. With this transmission the countershaft is below the main transmission shaft. The assembly is exceedingly simple and the construction is such that the gearset ought to endure under the heaviest service for an indefinite period.

In the Mercury delivery wagon the motor and the transmission are in two housings and one assembly, the transmission case being bolted to the engine casing. Because of the offset of the cylinders and the shape of the transmission housing the unit appears irregular in form. By the removal of two cover plates the interiors of the casings may be examined or work performed, there seldom being occasion to remove a part because of the extreme accessibility. This transmission is a planetary type with two forward speeds and reverse, the shaft being carried on heavy bearings. Simplicity and endurance are two of the qualities claimed for this construction.

Another transmission of unusual design is that installed in the Koehler delivery wagon, the case being of the barrel type with very long end bearings for the shaft. The shaft is mounted on a third bearing at the centre of the case. The transmission takes the place of the customary jackshaft assembly and within the housing at the left is the planetary gearset which has two forward speeds and reverse. The clutch is a cone in which the metal surfaces are operated in a bath of oil. The gears are of chrome nickel steel and the steel shafts, hardened and ground, are mounted in phosphor bronze bearings of great length in semi-steel casings. The transmission bands are extra width and are of semi-steel. The jackshaft and transmission case is so mounted in the chassis frame that the long bearings take the full load without side pressure leverage on the shafts.



Transmission Constructions: A, the Multiple Disc Clutch and the Substantial Gearset of the Grabowsky Truck; B, the Combination Transmission Case and Jackshaft Housing of the Koehler Delivery Wagon.

Radiator Mounting.

With practically all motor wagons of good design the radiators are installed upon springs that are intended to absorb the strains from chassis distortion and to eliminate the vibration that attacks the thin metal and eventually causes fracture. The connections with the motors are usually of rubber hose of large section and as the principal stress would come from the movement of the frame the designers have as a rule made provision for protection through suspension on springs. One of the most interesting is that used with the Sandusky machines in which the radiator is on springs carried on brackets and guides, and these in turn carry other brackets and guides supporting the gasoline tank.

The radiators of Victor trucks are built with a bracket at either side in which a hole receives a bolt anchored in the chassis frame, this bolt forming a guide for a short helical spring that resists all action. To prevent the heavy curved cross member of the frame in front of the radiator from reducing the radiation the member is perforated with three rows of holes. Into the reinforced sides of the radiator frames of the Federal trucks, and carried on stout steel rods, are two short helical springs of large diameter, separated by a substantial lug. This is neat and finished in appearance. The White truck radiators are carried on shock absorbers that are cylinders of large diameter enclosing helical springs above pistons, the lower ends of the piston or plunger rods being attached to bolts set transversely in brackets on the chassis frame. The radiator is so hung that it may be moved slightly in any direction without any stress whatever upon it.

The Pope-Hartford radiator suspension is with long rods fixed to the chassis frame on a bracket and to the radiator at the top, there being helical springs at the top and bottom of the rods with collars to retain the springs. This design relieves the radiator of strain and allows a slight transverse movement. Somewhat similar is the method of mounting the radiator of the Sanford delivery wagon, in which rods are anchored in the chassis frame and held by brackets on the dash at the top. At the top and bottom of the rods are coiled springs that are slightly compressed between brackets on the radiator frame and effectually resist distortional action of the chassis.

(To Be Continued.)

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FIRE DEPARTMENT NOTES

Presented herewith is a general view of a Locomobile combination hose and chemical wagon, made by the Locomobile Company of America, Bridgeport, Conn., duplicates of which have been furnished to a large number of fire departments throughout the country. These have given splendid satisfaction under all conditions of service and are more or less well known in various sections.

The motor is a four-cylinder, water-cooled unit, of Locomobile design, rated at 53 horsepower at 1300 revolutions a minute. The carburetor also is of the firm's own design, of the float feed type with single jet, and hot air connection with regulator. The fuel tank is with capacity as specified, up to 25 gallons, and is located on a superstructure behind or underneath the driver's seat. Feed is by gravity. Ignition is by high-tension dual system, magneto and storage battery. Cooling is accomplished by a honeycomb radiator with gear driven centrifugal pump. Lubrication is by force feed oiler, supplying oil under pressure to the main bearings and keeping the level constant. Additional oil is furnished the bearings by collecting the splash in cups cast in the bronze crankcase. The capacity is two gallons.

The transmission is four speed selective, housed in a bronze case. The clutch is a leather faced cone member of large dimensions with springs underneath the leather to prevent gripping. Drive is by double chain. The frame is of alloy steel of highest tensile strength and elastic limit, heat treated. Springs are semi-elliptic, of the finest alloy, two inches wide. The front members are 40 inches length and the rear 50. The front axle is of alloy steel, I beam section, solid Locomobile forging, heat treated, while the rear member is the same, the driving stresses being transmitted to the frame through strong distance rods. Emergency brakes are expanding on sprocket drums attached to the rear wheels, carefully balanced and equalized. Service brakes are contracting on countershaft, of large size and very effective.

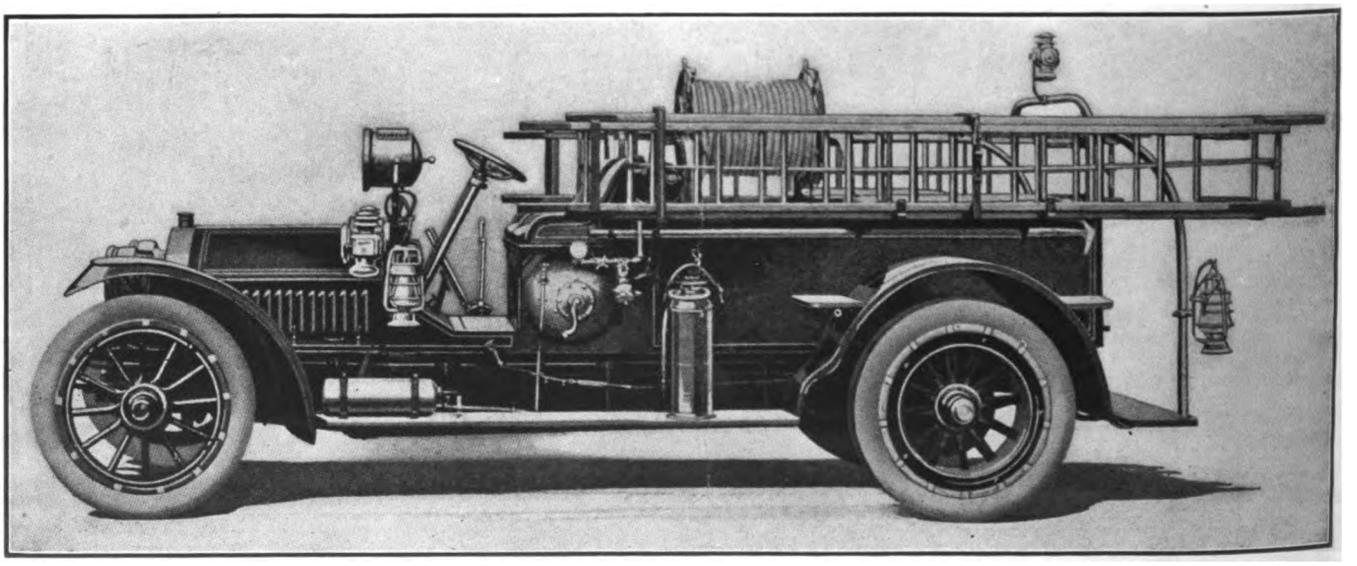
Wheels are of the artillery type, 40 inches diameter, of selected second growth hickory, and run on annular ball bearings, front and rear. The wheelbase is 148 inches. Tires are of the bolted-on type, being 40 by six inches, front and rear. The body is furnished in any design, to conform to the customer's specifications. The standard equipment includes two large acetylene headlights, combination oil and electric side and rear lamps, battery, horn, jack, tool bag, full kit of tools, and Prest-O-Lite tank.

In July the working efficiency of the department in Hartford, Conn., will be greatly increased by the addition of three Pope-Hartford combination chemical and hose wagons and two new chief's cars of the same make, produced by the Pope Manufacturing Company of that city. Orders for these cars have been placed after a thorough trial of two Pope-Hartford chemical engines and the deputy chief's wagon now in use.

Hartford's first Pope-Hartford apparatus was put into commission in June, 1910, and it proved so satisfactory that the second chemical engine and the runabout were purchased the following year. Now, besides placing the large repeat order chronicled above, the fire board announces a plan for the complete motorization of the department within a year, thereby eliminating in a large measure an annual expense of $12,000 for maintaining horses, which now do no actual fire fighting duty.

Among the other towns and cities which have placed repeat orders for similar equipment with the Pope Manufacturing Company may be mentioned the following: Westfield, Mass., two; Fall River, Mass., two; New Haven, Conn., four; Jersey City, N. J., three; Brockton, Mass., two; Middletown, South Manchester, Bristol, Branford and Danbury, Conn.; Worcester, Pittsfield, Mansfield and Lynn, Mass.; Passaic, Bayonne, Kearney, Park Ridge and Nutley, N. J.; Port Chester, N. Y.; Wilkesbarre and Butler, Penn.; San Bernardino, Berkeley, Santa Rosa and Santa Barbara, Cal.; Medford, Ore.; Kansas City, Mo., and Terre Haute, Ind. Included in the list of cities now having apparatus manufactured by this concern are: Taunton and Northampton, Mass.; Rochester and Hastings-on-the-Hudson, N. Y., and Portsmouth, N. H.

Chief S. W. Hunter of Springfield, O., has kept an accurate account of the cost of maintenance of the motor fire engine in his department and recently submitted a report to the mayor, covering the entire time since the vehicle was placed in commission. The apparatus has a 70 horsepower



Type of Locomobile Combination Hose and Chemical Wagon, Which Has Met with Decided Success in Numerous Installations.

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motor. Its speed is 60 miles an hour. It pumps 700 gallons of water a minute and is loaded with 1000 feet of 2.5-inch cotton rubber hose, two three-gallon chemical fire extinguishers, one hard and one soft rubber suctions, one 20-foot extension ladder and one 10-foot roof ladder, and six men. The machine was placed in service June 9, 1909 and the account follows:

Gasoline, grease, oil, 1909	$35.24
Gasoline, oil, repairs, 1910	78.32
New tires and adjustments, 1910	252.75
Gasoline, oil, repairs, 1911	107.58
New tires and adjustments, 1911	222.00
Total cost	$695.89
Total miles travelled	1316
Total hours, engine pumped	16
Total runs made	494

Although the Stegeman Motor Car Company, Milwaukee, Wis., has devoted its attention heretofore to the production of industrial transports varying in load capacity from one to six tons, it is of interest to note that it has entered the fire apparatus field. An accompanying illustration presents the Stegeman fire insurance patrol wagon in service with the Milwaukee Board of Fire Underwriters, and it is the second piece of motor driven equipment in that city. The Stegeman patrol is constructed along truck lines, to withstand heavy service and the severe test of negotiating the unimproved roads in the outlying sections, which is the particular field of this vehicle. In order to effect the greatest safety and overcome the ever present danger to cars of this weight at high speed when rounding sharp turns or corners, the machine is designed with underslung springs, so as to secure a low centre of gravity. An additional factor along this line is the provision for a majority of the weight on the rear wheels. It is maintained that these work together in holding the car to the road in extreme hazards, preventing the danger of overturning and permitting more positive control by the driver.

The motor is of the four-cylinder vertical type, giving 50 horsepower by dynamometer test with direct drive on high speed, or when travelling from 35 to 40 miles an hour. The drive is by jackshaft to the rear wheels, through enclosed chains running in bath of lubricant. All operating parts are enclosed and run in oil or grease. Oil holes have been eliminated and lubrication throughout is furnished by large and positive grease cups. The frame is of pressed steel, reinforced with five cross sections and strengthened by thrust rods between spring centres. All mountings of the wheels are on ball bearings with a special thrust bearing to take up excessive side strains in making the necessary turns, so frequent with fire apparatus. The rear axle is of chrome nickel steel, guaranteed against breakage. The springs are semi-elliptic, front and rear, made of silico manganese steel, and also are guaranteed for life. Supplementary coil springs and shock absorbers take up all excessive spring action and all injurious rebound.

The body is constructed of welded steel, eliminating all rivets. Lockers are built on both sides with a through centre aisle. The cushions are fastened to the locker cover and when raised are automatically held in position to permit of quick removal of the 32 large canvas waterproof covers utilized by the crew in protecting property in time of fire. The driver's seat is heavily upholstered and divided into two compartments, one for the operator and the other for the captain. The duty of operating signals is delegated to the latter, leaving the driver free in his control of the car. The gong is operated by the right hand and the siren horn through a lever depressed by the left foot.

A large acetylene searchlight is automatically lighted by electricity and the motor is equipped with a self-starting device, putting all of the mechanism into immediate control by automatic appliances. The tires are of the airless cushion type, with large dual equipment in the rear. The control is of the well known Stegeman design with left hand position of driver and right hand shifting levers.

The patrol was placed in service in midwinter and was given an extreme test in climbing all the steep hills of the city through a deep fresh fall of snow, in which trial the low speed was never employed. It is stationed at house 2, Ninth and Calena streets, and covers the outlying sections of the north, east and west sides. Its squad includes eight men.



Fire Insurance Patrol Wagon Mounted on Stegeman Chassis and in Service with the Board of Fire Underwriters in Milwaukee, Wis.

The board of fire wardens in Nantucket, Mass., has contracted with the Knox Automobile Company, Springfield, Mass., for a chemical engine, which is to be delivered to the call company of 10 men within three months. With its complete equipment the engine will weigh 6000 pounds. It will be driven by a four-cylinder motor of 50 horsepower, and will be equipped with all the latest fire fighting features.

The city council of Trinidad, Col., has ordered the immediate purchase of an automobile fire truck at a cost approximating $5000.

The fire commissioners of Southington, Conn., have placed an order with the Knox Automobile Company, Springfield, Mass., for a combination chemical and hose wagon, to be delivered in August.

The board of aldermen in Nashua, N. H., is considering an appropriation of $6000 for the purchase of automobile equipment.

The fire department in Hoboken, N. J., has ordered a 30 horsepower American car, made by the American Motors Company, Indianapolis, Ind., for the use of Chief Dunn.

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Seven years ago the Detroit fire department purchased two friction driven Cartercars, made by the Cartercar Company, Pontiac, Mich., for the use of its deputy chiefs. These machines gave such satisfaction that the number has been increased to seven, the order for five more having been given only recently. The original Cartercars are still running and are in active service daily.

The city of Pawtucket, R. I., has appropriated $7500 for the purchase of motor fire apparatus to replace that now stationed at house 1, which is to be transferred to South Woodlawn.

Mayor P. W. Clement of Rutland, Vt., has laid before the city council a resolution appropriating at least $5000 for the purchase of automobile fire equipment.

As is well known the city of Birmingham, Ala., is deeply interested in motor fire fighting apparatus, having decided to replace all of its horse drawn equipment. During the first month the present 14 pieces of automobile apparatus were in service the cost proved a welcome surprise to the officials, being set forth in the following table:

Company	No. of Alarms	Blocks Travelled	Gals. Fuel	Gals. Oil	Lbs. Grease	Total Cost
Hose 1	45	578	55.0	1.00	.25	$5.81
Hose 2	50	930	35.0	2.12	.25	6.71
Hose 3	32	500	35.5	.81	1.00	5.11
Engine 3	21	325	46.0	2.25	1.00	6.82
Hose 4	32	434	30.0	2.50	1.00	5.17
Hose 5	13	219	15.0	1.00	...	2.82
Hose 6	29	360	35.0	1.75	.75	5.08
Hose 9	6	105	35.0	1.25	1.25	3.89
Hose 10	12	182	54.0	3.12	.75	6.35
Engine 11	27	760	61.0	2.50	...	6.85
Hose 12	4	52	30.0	.50	3.06	3.30
Engine 13	6	76	8.0	.50	...	.95
Hose 16	9	176	10.5	1.00	.12	1.13
Hose 19	5	66	10.0	.75	...	3.73

The 14 pieces answered 144 alarms, practised 39 hours, traversed 4765 blocks, used 360 gallons of gasoline, 20.31 gallons of lubricating oil, eight pounds of pressure grease, changed two Prest-O-Lite tanks, replaced 24 dry cell batteries, one spark plug and one gas burner, at a total cost of $63.72, an average of about $4.50 for the upkeep of each machine. Of course this does not include interest on the investment, depreciation or tires. However, when it is remembered that the cost of horses for the 14 pieces of apparatus which these replaced averaged $450 a month, without counting the accidents to horses, men and machines, the difference in favor of the automobiles is quite marked, to say the least.

Through the efforts of the municipal committee of the Board of Trade in Philadelphia, $41,000 has been placed at the disposal of the department for the purchase of automobile equipment. George D. Porter, director of public safety, and Chief Waters of the fire department are engaged upon the work of preparing the specifications, and it is understood that the vehicles will be equipped with life saving devices and fire fighting appliances, and constitute what will be termed a "Flying Squadron."

Recently, one of the citizens of New York City criticised the department for the purchase of the gasoline pumping engine which has been in service for some months past. In reply Fire Commissioner Johnson says:

"I agree that the pumping efficiency of the new gasoline pumping engine is not all that it might be or will be. Engine 39 is capable of pumping 744 gallons of water a minute, or about as much as a second size steam engine. A first size steam engine will pump 900 gallons a minute. The cost of engine 39 was $10,000. A steam engine costs $5000.

"If this were all there is to it, there would be no room for argument, but there is more. When we buy a steam engine we have to buy three horses at $350 each. The upkeep of each horse is $360 a year, or $1080 for the three. An engine driver costs us $1400, and an engineer $1500. Therefore a new engine costs us $10,130 for the first year. The following years it costs $5130 without cost of repairs or fuel.

"Automobile fire engine 39 cost us $10,000. A driver, who also attends to the gasoline pump, draws a salary of $1600. Gasoline and repairs cost us $200. Therefore, an engine of this type stands us about $11,800 the first year and $1800 each succeeding year."

Norwich, Conn., has followed the example set by other progressive cities in installing a piece of motor propelled fire apparatus which is a combination hose and chemical wagon made by the Pope Manufacturing Company, Hartford, Conn. The body is fitted with seats running lengthwise and accommodates eight men. The equipment consists of 1000 feet of 2.5-inch water hose and a chemical tank of 35 gallons capacity which is located under the driver's seat. The hose is carried in a metal basket having a capacity for 250 feet. Ladders, axes, etc., complete the equipment.

Marlboro, Mass., is considering motor propelled fire apparatus and President Bourdreau is using his influence to convince the members of the board of aldermen that the automobile would not only vastly increase the efficiency of the department but it would save the town at least $300 a year. The sentiment of the representative business men is in favor of the change from the horse drawn equipment.

The following cities and towns have made appropriations for or are considering the purchase of motor propelled fire apparatus: Bellingham, Wash.; Milwaukee, Ore.; Port Huron, Mich.; Terre Haute, Ind.; Freeport, Ill.; North Vancouver, B. C., Canada; Braintree, Mass.; Youngstown, O.; Lynn, Mass.; La Grande, Ore.; Arlington, Mass.; Macon, Ga.; New Brunswick, N. J.; Montpelier, Vt.; Pasadena, Cal.; Milwaukee, Wis.; Shelton, Conn.; Petaluma, Cal.; Portsmouth, N. H.; Passaic, N. J.; Tennallytown, D. C.; Canton, O.; Visalia, Cal.; Barre, Vt.; Portland, Ore.; New Britain, Conn.; Racine, Wis.; Sioux City, Ia.; Andover, Mass.; Reading, Mass.; Columbus, O.; West Springfield, Mass.; Plymouth, Ind.; Milton, Penn.; Pittsfield, Mass.

Newburyport, Mass., desires the automobile to replace its horse drawn fire equipment, but the News of that city comments editorially as follows: "If the city of Newburyport is to purchase automobile fire apparatus it should do so only after there is a sale of some of the equipment now in service. A city of the size of Newburyport which has four engines in commission is a rare one and has equipment sufficient to cope with any usual conflagration and most unusual ones. To spend money to add to this equipment, while all this is to be retained and the department kept up to its present size, would be waste. Let us keep the department in splendid shape, but let's not go crazy about it. A piece of automobile apparatus would be a fine thing, but it should come only in place of a reduction in other lines, and not in addition to what we already have."

Doubtless there are other towns and cities which occupy a position similar to that of Newburyport, but the economic principles involved should be taken into consideration, as it has been proven time and again that automobile apparatus means a saving of several hundred dollars a year over the horse drawn equipment, to say nothing of the reduction in fire losses due to the speed of the machine. The question of insurance rates is also worth considering.

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KNOX AMBULANCE FOR EXPORT.

AN ambulance possessing many excellent features of construction and equipment and which is said to be the most perfectly appointed ever built in this country, has been completed by the Knox Automobile Company, Springfield, Mass., for foreign shipment. The demands for modern hospital practise require ambulances fitted with all possible conveniences as it has been demonstrated that prompt attention to the condition of the patient while en route to the hospital is an important factor in effecting recovery, and the latest Knox vehicle has been designed to fulfill all these requirements.

In the illustration herewith is presented the ambulance, with chassis of standard Knox construction throughout, being equipped with a four-cylinder, four-cycle, water-cooled motor, rated at 40 horsepower. The wheelbase is 134 inches and the wheels are equipped with 38 by 5.5-inch pneumatic tires single in front and dual at the rear. These large shoes with long semi-elliptic springs on the rear, provide extremely comfortable riding qualities.

The body is unique because of its design and appointments. The frame is of carefully selected ash, strongly braced to insure lightness with strength and freedom from squeaking or rattling. Sheet aluminum is utilized as the outside covering, and this is made in seamless panels, while the inside is sheathed with three-ply laminated white wood. The flooring is of ash, covered with linoleum.

Back of the driver's seat the body is divided into two compartments, the forward end having a door at either side, also a folding seat facing forward for the doctor's use. This compartment serves as a side entrance or a passage way for the rear compartment and opens directly into the latter without intervening door. Directly behind a partition at one side of the vehicle are located two cots, one above the other, supported by springs. Each cot is of the folding type, adjustable to any angle, and is supported by a metal slidable tray into which it moves readily. Below the lower cot is a large locker for the convenient storage of medicines, etc.



New and Richly Appointed Ambulance Constructed by the Knox Automobile Company, Springfield, Mass., for Service Abroad—It Is Fitted with Modern Conveniences for Care of Patients and Is Unusually Easy Riding.

Two folding seats are provided on the side opposite the cots, one at the head and the other at the foot, and between them, on the side of the body, is arranged a neat folding hot and cold water outfit with sink and drainage tube leading to the outside of the car. A small alcohol lamp serves to heat the water while on the way to secure the patient. In addition to these arrangements, there is a large Thermos bottle equipped with a rubber tube and stop-cock directly over an antiseptic tray and pad, while drinking cups are also provided in a convenient bracket.

Ample ventilation is furnished by three shutter ventilators on each side, under the roof, while additional air may be secured by dropping the windows in the doors. A window on the side opposite the cots, combined with those in the doors, affords excellent light, and double doors at the rear provide ample space for entrance and exit.

The interior of the body is finished in pure white enamel, presenting a particularly clean and sanitary appearance, while the exterior is also white with a fine gold stripe. For night use the entire car is lighted by electricity, current for the two large dome lamps being supplied by a dynamo driven by the motor. Storage batteries supply electricity when the motor is not operating and these are automatically charged by the generator. Every modern convenience for the comfort and care of a patient has been installed in this ambulance.

WORKING FOR A BUS LINE.

The Commercial Club of Fort Dodge, Ia., is working earnestly for the establishment of a motor 'bus line and at a recent meeting a committee was appointed to solicit funds for the new project. An active campaign is in progress and the club expects to secure the line in a short time.

SELECTS SAMPSON TRUCK.

G. L. Summey, chief engineer of the Chase Rolling Mills Company, Waterbury, Conn., said to be one of the largest brass manufacturing concerns in the world, has been investigating motor trucks for a number of years. In fact, it may be stated that the Chase company was one of the first concerns in Waterbury to test commercial vehicles. Its factory is located on top of a long hill, reached over vitrified brick pavements from the centre of the city, and the problem of hauling by horses is by no means easy of solution. After spending some $7000 and three years' time in investigating all makes of trucks, Mr. Summey has decided upon the purchase of a Sampson, made by the Alden Sampson Manufacturing Company, Detroit.

REPRESENTS REMY IN CANADA.

Taylor & Arnold, Ltd., of Winnipeg and Montreal, Can., one of the largest railway supply houses in the Dominion, has become the sole representative of the Remy Electric Company, Anderson, Ind., maker of Remy magnetos. The various branches maintained by this concern will be utilized as service stations for the Remy products, as well as distributing and selling points.

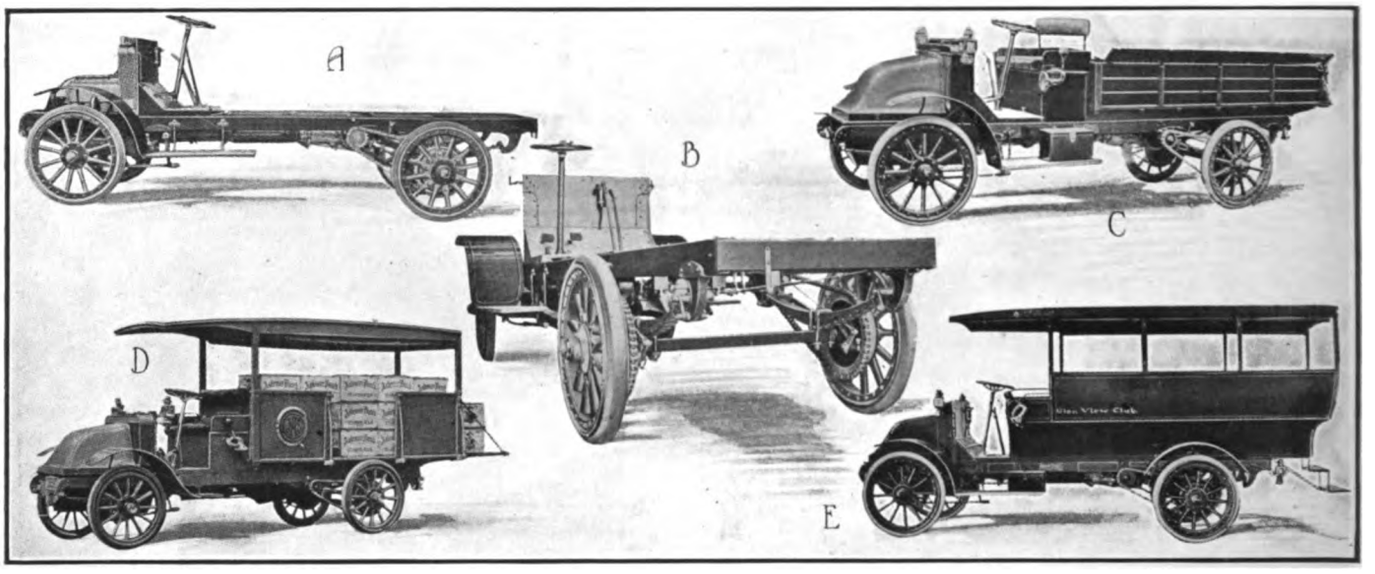
W. S. Hathaway of Kansas City, Mo., has organized the Southwest Motor Company, which will represent Reo trucks, made by the Reo Motor Truck Company, Lansing, Mich., in that section at 1616-1618 Grand avenue.

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FEATURES OF ADAMS CONSTRUCTION.

SIMPLICITY of construction, and consequently of operation, has the effect of an axiom with the Adams Bros. Company, Findlay, O., in the production of the Adams one-ton truck. Complexity of parts is held to mean congested cost of upkeep and needless necessity for repairs and replacements. With the object in view of keeping the cost of operation and maintenance to a minimum, the Adams chassis has been built with as few working parts as careful design and extended experimentation have demonstrated is possible. There is claimed to be little chance that parts will become deranged because of careless driving, but regardless of this, all components have been designed and built interchangeable, being constructed by special machinery and from the best material obtainable.

The Adams Bros. Company built successful machinery over 40 years ago. In engineering, foundry and machine practise it has held front rank. Its decision to enter the commercial vehicle field was made after thorough consideration of the needs, and the Adams truck was conceived with the specific idea of measuring up to the high standard set by the other products of the concern. Each component is constructed to perform its particular duty and to work in complete harmony with every other part and piece as a perfected whole.



Adams One-Ton Truck: A, Side View of Chassis; B, Rear View of Chassis, Showing Axle Construction and Spring Suspension; C, Standard Express Body; D, Special Delivery Body with Removable Panel; E, Fitted as a Club 'Bus.

One feature cannot be emphasized too strongly. The Adams truck is not an assembled vehicle, but is constructed throughout in the factory of the Adams Bros. Company. Everything from the motor and radiator back to the rear axle is the product of this concern in its own shops. The various components have been subjected to the most rigid tests and the finished product is thoroughly tried out under every road condition before being placed upon the market. As a result, the Adams one-ton truck not only represents simplicity of construction, but inherent reliability, which is backed by a substantial guarantee covering a period of one year from the date of delivery.

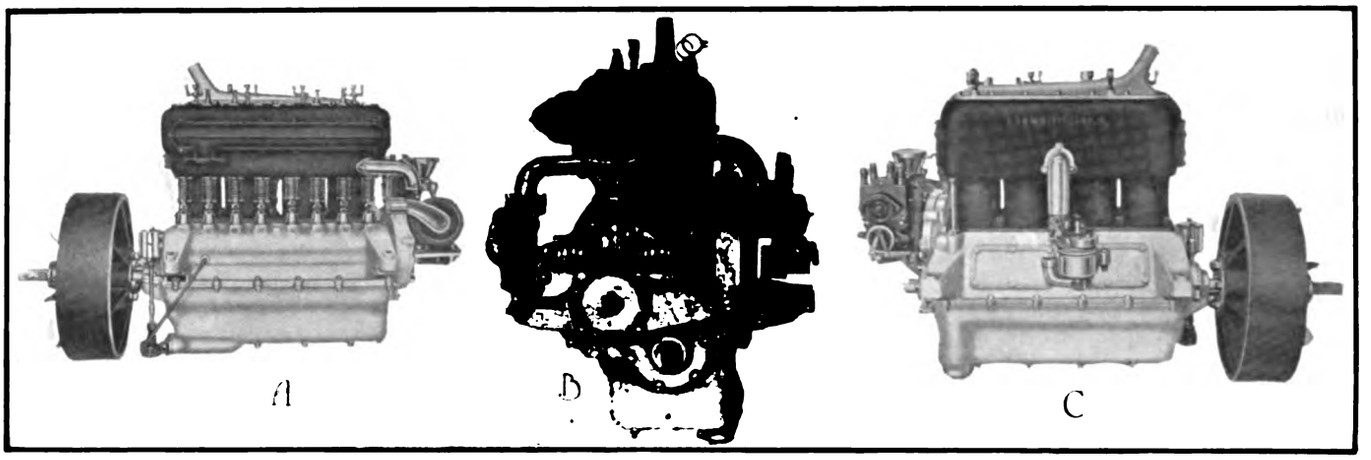
Something may be said of appearance, and in this respect the maker claims originality of design and careful attention to detail. Accessibility is another important factor, and with this in mind, the water pump, oil pump and gauges, carburetor, magneto, oil filling funnel and breathing tube have been so placed as to be reached easily. The radiator is situated behind the engine, following foreign practise, and is readily filled from either side. This location is held to eliminate entirely all danger of casual injury, and at the same time makes for added accessibility, in that the hood is hinged at the top of the radiator so as to be lifted from the front, exposing the entire power plant for work or removal.

After careful consideration of the matter of driver's location, it has been decided to place the steering wheel at the left. This not only provides for easy access to the seat from the sidewalk or curb without passing around the truck but is held to make for more satisfactory operation in congested traffic. The control levers are placed in the centre of the floor boards, adding still another feature of simplicity and accessibility.

The motor is a four-cylinder, four-cycle, water-cooled unit with bore of 3.875 inches and stroke of five, rated at 30 horsepower. The cylinders are cast en bloc of a very high grade material, and liberal provision has been made for ample water circulation between each cylinder. Pistons are of a special grade of cast iron, accurately ground and fitted with piston rings of the same material, ground on all working sides. The crankshaft is drop forged of 3.5 per cent. nickel steel. It has large diameter and unusual length of bearing journals, with three bearings of a special composition insuring excellent service. The camshaft is also drop forged with integral cams, being entirely enclosed in the upper half of the crankcase and actuated by means of spiral gears. All valves are mechanically operated and interchangeable. They are of liberal diameter and located on the right side of the motor.

The crankcase is made of the finest grade of aluminum alloy, and is so designed that the upper half contains all the working components comprising the motor, while the lower half constitutes the oil reservoir supplying the lubricant to all working parts. The lubrication system is so arranged as to offer the combined advantages of the constant level splash and force feed systems. Positive water circulation is effected by a spiral gear driven centrifugal pump, aided by a fan located in the flywheel. The radiator is of the vertical tube type, provided with two filling caps, one on either side, and is carried at the rear of the motor on flexible supports. This location is held not only to protect this member from possible collisions, but the mounting is such as to eliminate any damage emanating from the unequal motions to which the side rails of the frame are

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Three Views of the Adams Motor: A, Left Side, Showing Exhaust Manifold and Valve Arrangement; B, Front, Presenting Location of Magneto, Water Pump and Oil Filler; C, Right, Indicating Position of Carburetor and Inlet Manifold.

necessarily subjected in traversing rough roads.

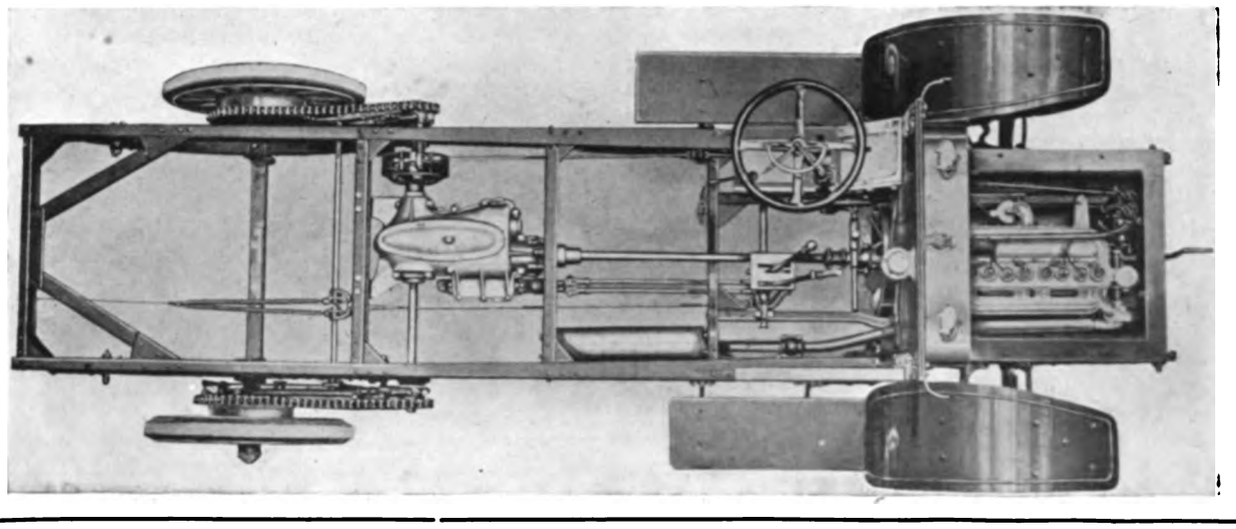
Ignition is by dual system, employing an Eisemann high-tension magneto. Steering is accomplished by an irreversible screw and nut Ditwiler type post located on the left, permitting a clear view of the road in either direction. The spark and throttle control is mounted on the steering wheel, and with the location of magneto and carburetor, all connections between these and the steering post are established directly by two straight rods, doing away entirely with the intricate net work of numerous connecting rods, bell cranks and levers. The carburetor, which is a Kingston, is also controlled by pedal. The arrangement and location of magneto, water pump, filling funnel and oil gauge on the front end of the engine affords extremely easy access to any part of the motor by simply lifting the hood, and this may be removed without disturbing any other adjoining part.

The clutch is a Wells expanding disc member, so designed as to permit of easy engagement, and it is claimed that the car will pick up smoothly without undue strain on the transmission, axle or other driving parts. The transmission is of the selective type, providing three speeds forward and reverse, direct drive being on the high. This is located in the centre of the car and connected with the clutch by the driving shaft and universal joints which take up all variation in alignment, resulting in traversing rough roads. All working shafts are of special alloy steel. Final drive is by double side chain, having 1.25-inch pitch and .75-inch roller.

Brakes are three in number, one service member on the jackshaft, operated by pedal, and two emergency members on the rear wheels, operated by hand lever. The levers are located in the centre, where they are operated in a natural manner by the driver's right hand. The frame is of special high grade pressed steel, 38.75 inches wide, offset between the front wheels by a generous U section. The axles are of Sheldon manufacture, of special design for most satisfactory service under the severest conditions. Springs are semi-elliptic, front and rear, the former being 2.25 inches width and 44 inches length and the latter 2.5 inches width and 44 inches length. Wheels are of the artillery type 36 inches diameter, fitted with three-inch solid tires in front and 3.5-inch in the rear. The wheelbase is 121 inches and the tread 56.

Any standard body is fitted, and the company is prepared to build any type of special equipment as desired. Accompanying photographs give some indication of the special bodies which have been produced for varying classes of work. The regulation loading platform has an inside measurement of eight feet 10 inches length by three feet 10 inches width. The standard color is battleship gray, although the painting is optional. With the machines are furnished two electric and oil side lamps and tail lamp, full set of tools, jack and horn. The gasoline tank has capacity of 15 gallons.

The Adams Bros. Company is confident that it has met every requirement in simplicity, stability, efficiency and appearance. In making sales, every care is taken to provide a vehicle and body suited to the particular needs of the individual case.



Plan View of Adams One-Ton Chassis, Indicating Simplicity of Design and the Limited Number of Working Parts.

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NEW FREIGHTERS IN PORTO RICO.

Systematic Attempt to Solve the Problem of Long Distance Haulage, in Which Industrial Transports Will Compete Actively with Railroad Service.

By R. W. Hutchinson, Jr.

WHILE the motor truck has been regarded mainly as a freight carrying institution suitable for city service, it is of interest to note that it has proven itself of greater efficiency than the railroad for certain conditions of moderate distance haulage. That such a radical step has been taken by a large general trucking corporation on the island of Porto Rico, utilizing industrial transports for haulage that can be considered in the long distance class, indicates very forcibly the degree of dependability which can now be placed in the first class commercial vehicle. That the motor truck has proven itself adaptable under the most extreme conditions of climate and roads also indicates that the "new freighters" can no longer be regarded as machines for service only on nicely paved streets.

One of the largest installations of motor trucks for general transportation service has just been made by the International Motor Company, New York City, maker of Mack, Saurer and Hewitt vehicles, with the Porto Rico Motor Company, which has bought 30 Saurer cars. Before the order was placed, the traffic department of the International company studied the conditions in Porto Rico at close range. The selection was made after an investigation of a number of makes of trucks and the decision was reached after a thorough knowledge of one of the most serious factors against the use of such vehicles under road conditions as severe as those which exist on that island, that of tire troubles. Every item of transportation cost was charted and not the smallest detail was neglected in predetermining the lucrativeness of the enterprise.



The First Installment of the Thirty Saurer Cars Recently Shipped by the International Motor Company for Freight Service in Porto Rico.

The Island of Porto Rico has a population approximating 1,114,000, and a total area of 3600 square miles. The people are distributed generally all over the island with the largest cities and towns near the coast. The density of population is greater than that of any other sub-division of American territory, with the exception of Rhode Island, Massachusetts and New Jersey. The island is divided into 66 municipalities, and the incoming supplies and outgoing products pass through the principal towns.

The chief transportation system is the American Railroad of Porto Rico and certain allied railroads. This is a narrow gauge line extending along the coast from Carolina, east of San Juan on the north coast, around the west end of the island and along the south coast to Guayama. A branch of this system extends from San Juan to Caguas, and this is the only branch of importance reaching the interior, with the possible exception of the Valdez road between Catano and Bayamon. Along the east coast of the island there are several separate railroads owned by the Sugar Centrals, and used for hauling cane. It seems probable that at some later date these separate railroads will form a part of the general system, extending all the way around the island.

The main ports are San Juan and Arecibo on the north shore, Ponce and Arroyo on the south shore and Mayaguez and Aguadilla on the west. There are certain minor ports, such as Fajardo Playa, Humacao Playa, Aguirre and Guanica. There are no land locked harbors on the island, with the exception of San Juan, Aguirre and Guanica; all of the other points used as ports are open roadsteds. When ships are discharged or loaded in these latter, it is necessary to use lighters and other vessels which maintain a coastwise shipping service.

The transportation of freight between the coast and the interior is at present carried on almost entirely by means of bull carts, and the service given by the railroad is so unsatisfactory, particularly with regard to the shipments of less than carload lots, that bull carts are competing with the railroad on roads parallel to their lines.

The business of the island is increasing at a rate varying from 16 to 20 per cent. a year, as shown by the reports of the customs service, and the need of an adequate system of transportation is becoming more and more imperative, especially between the coast and the interior. There is a wide variation in the rates charged for transportation by bull carts, this being from 15 to 40 cents a ton-mile. The number of cattle on the island is diminishing and as more land passes under cultivation the pasturage for cattle is decreasing. The grades in the interior prohibit the construction of railroads through this section for a long period, if at all.

So imperative has become the necessity for additional means of transportation that some American mules have been imported. These are used only to a very limited extent, however. There are at present about 45 motor trucks on the island, and approximately one-third of these are of the first class. These are usually owned in lots of one to three by individuals, although there are two or three automobile truck companies. In general, it may be said that

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with the exception of the Atlas Transfer Company, which is operating from six to eight trucks in the immediate vicinity of San Juan, no attempt has been made to install an automobile truck system along anything like broad lines, previous to that described herein.

The lands on which coffee, tobacco and a portion of the sugar are raised are in the interior of the island and the principal use for an automobile would be in carrying provisions and mechandise into the interior and bringing out these products. The movement of provisions and merchandise toward the interior towns is comparatively steady, with a somewhat larger volume in January than in other months of the year. One feature of this movement is quite pronounced, in that the bulk of these goods come from the coast cities, such as San Juan, Ponce, Guayama and Arecibo. The reason for this is found in the fact that the merchants in these cities are in a better position to give credit than are those of the towns of the second grade.

The roads of the island are divided under two systems, one known as the insular, which penetrates most of the important sections and which in a few years will form a very complete network, and that known as the municipal. The first is under the care of the insular or federal government and is a magnificent system of macadamized roads with grades seldom more than seven or eight per cent., and in no case exceeding 15. The second consists of ordinary dirt roads, maintained by the different municipalities, or local governments, and forming connecting links between the insular roads. A great many of these are practical for motor trucks, except during the season of heavy rains, which occurs between Sept. 1 and Dec. 1.

It is not proposed that the automobile truck system to be used by the Porto Rico Motor Company shall operate over the municipal roads except in special instances, but it is proposed to operate these trucks over the insular roads, which now touch, or will very shortly touch all of the main towns. The system may be considered as having been separated into six divisions as follows: Division 1, San Juan-Cayey; 2, Bayamon; 3, Ponce-Aibonito; 4, Ponce-Arecibo; 5, Guayama-Cayey; 6, Guayama-Maunabo. The points at which garages are required are San Juan, Caguas, Ponce, Arecibo and Guayama.

The organization of the company operating this system is to be along the lines of the diagram presented below. The clerks, stenographers and one of the machinists in each of the shops at San Juan and Ponce will be Porto Ricans, while the officers and the remainder of the employees of the company will be American, as follows:

General Manager

—Superintendent, San Juan—			——Superintendent, Ponce——		
Foreman Bayama	Foreman Caguas	Foreman San Juan	Foreman Ponce	Foreman Guayama	Foreman Arecibo

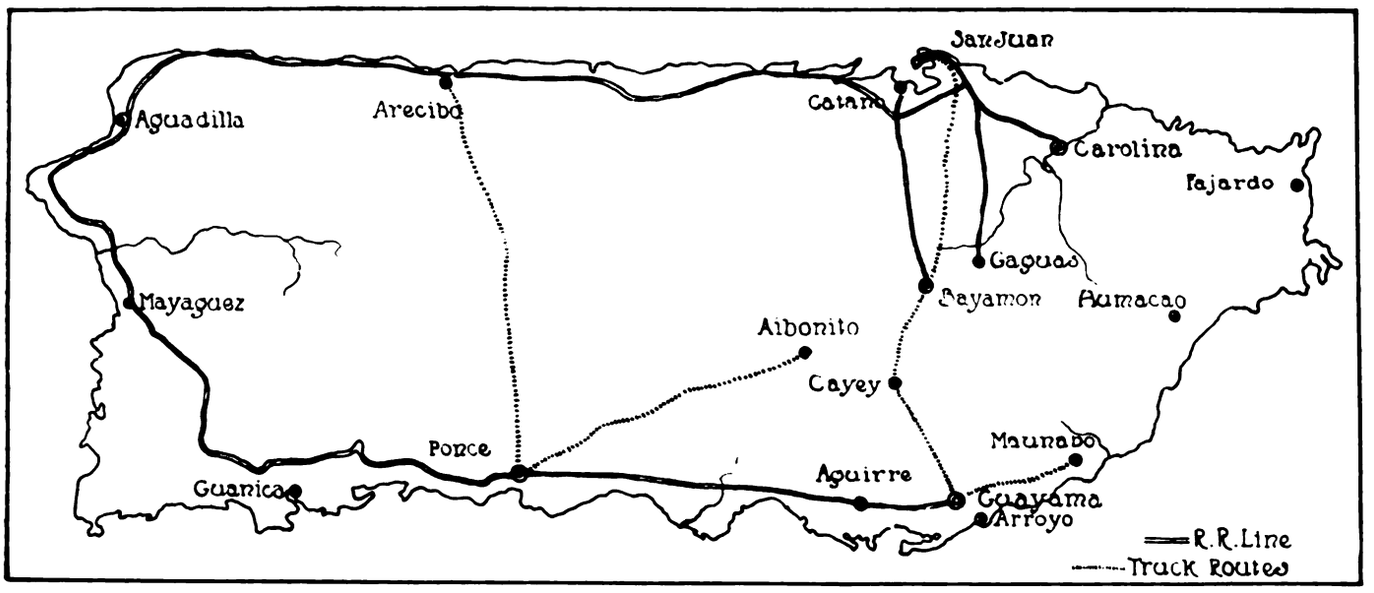
Stenographer — Cashier and Paymaster

Clerk — Stenographer

Conditions are such that the trucks will be required to operate over roads running through mountainous country. The maximum limit guaranteed by the government for the bridges on the routes is eight tons for one vehicle. The type of freight is such that 10,000 pounds can be handled properly by a stake body 12 feet long, six feet wide and six feet high. A truck to be successful under these condimust be designed particularly for mountain work.

The Saurer truck of five tons capacity fulfills all of these conditions, and is particularly suitable for this proposition. The motor air brakes with which this vehicle is equipped are a decidedly valuable feature in this country. The light weight of the chassis insures the most economical results in tire maintenance.

In connection with this last item, it has been found that on automobiles operating in Porto Rico the costs are exceedingly high for reasons which are not thoroughly understood. A certain tire company, however, stated that it would be willing positively to guarantee its product for the minimum of 5000 miles of travel on the island, and that users of its tires will be given the benefit of a better guarantee if it is found that this figure can be increased.



Map of Porto Rico, indicating Present Railroad Facilities and Cities Which Will Be Served by New Motor Truck System.

The transportation system, which adequately provides for the needs of the territory now under consideration, eventually will control practically all of the interior traffic of the island. Twice as many trucks as those ordered for the initial installation will be needed in the future, and possibly three times as many.

The greatest volume of traffic is found in the central portion of the island. For these reasons it was recommended that the initial installation be confined to that section between San Juan, Guayama, Ponce and Arecibo, as mentioned before. It will be noted that no provision has been made for operating trucks in the neighborhood of Manati, Ciales and Morobis, for the reason that all hauling to and from Manati and Vega Baja is done by railroad and the road between Manati and Vega Alta is not yet completed. This section will be considered later.

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New Commercial Car Accessories

Cooper Valve Lifter.

A new type of valve lifter which presents several practical features has been brought out by John J. Cooper, Providence, R. I. It consists of two parts, a U shaped member carrying a hinged lug into which is threaded a screw member, and a lever. The lower end of the former is recessed to fit and engage the slotted portion of the lever. The latter is slightly curved and is equipped with tilting shoes which engage with the retaining mechanism of the valve spring. The upper surface of the lever has a series of notches, these being for the purpose of engaging a brace member which is attached to the handle and so arranged that when the valve spring is compressed the brace slips into place and automatically locks the tool in position, allowing the operator the use of the hands in removing or replacing the retaining mechanism of the valve.

Ellis Fuel Purifier.

The Ellis gasoline purifier, for which the L. P. Rhines Company, Boston, is special agent, is a device for incorporation in the fuel line between the tank and the carburetor. It is simply constructed and the maker states that not only is the fuel purified but fine particles of kerosene, dirt, etc., are absolutely prevented from reaching the vaporizer. The fuel first enters the precipitation chamber, then is filtered through two fine screens, two felts and quartz, whereby foreign elements are retained. Any water in the gasoline lodges in a separate chamber while the fuel rises and passes through the filter to the carburetor. The device is easily drained of the impurities caught by turning a small thumb screw. It is compact, weighs about six ounces and is constructed of an aluminum composition. It comes complete, including brass unions, and these are made in three sizes.

All in One Wrench.

Combination wrenches appeal to operators who do not like to carry a large number of tools in the kit. The Universal Wrench Company, Indianapolis, Ind., is marketing a novel device which it is claimed will perform the work of numerous tools. The jaws of the wrench are adjustable and so constructed that they may be employed for removing nuts or working on piping. Eight different angles may be secured as well as ratcheting in either direction. The tool is nine inches long, constructed of high grade steel and guaranteed.

Macdonald Tire Chain Tool.

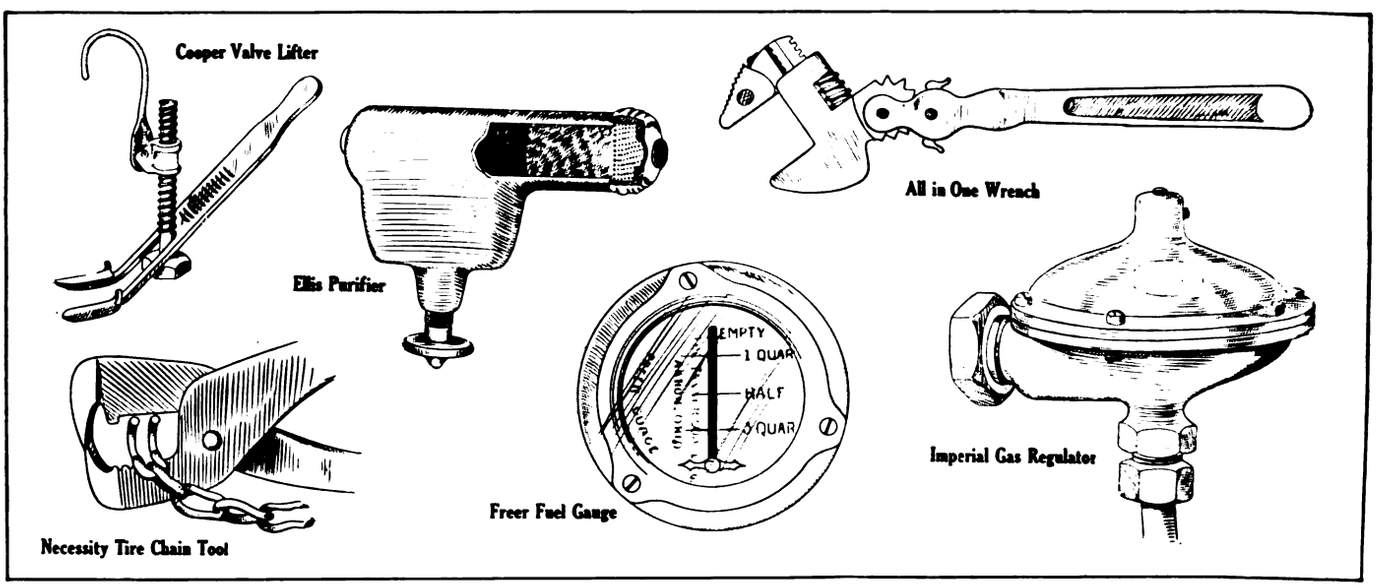
The Necessity tire chain tool, manufactured by J. N. Macdonald & Co., Wethersfield, Conn., and for which T. F. Russell & Co., Boston, is distributor, is a device for repairing tire chains. The jaws of the instrument are so constructed that the hooked ends of the chain links may be forced apart and compressed easily, and it is claimed by the maker that repairs may be effected in a very short time.

Freer Gasoline Gauge.

The Freer gauge manufactured by the Tanner Gage Company, Akron, O., is designed to register the amount of fuel in any type of tank and consists of a reading dial attached to the top of the container. The dial is calibrated and a needle or hand indicates the amount of fluid in the tank. The registering member is actuated by a float device in the tank and its construction is such that the maker claims it is impossible for it to get out of order. The reading dial is of glass, .25 inch thick, set between cork washers, and enables the operator to inspect the contents of the tank without danger of explosion when a light having a naked flame is utilized.

Imperial Pressure Reducer.

The Imperial Brass Manufacturing Company, Chicago, has brought out a new device designed to reduce the pressure of acetylene when utilized from a tank. It is incorporated in the line between the container and lamps and the pressure of the gas is automatically regulated and may be reduced as low as two ounces. It is claimed by the maker that a steady and even flow of gas is assured and that considerable economy is effected by the use of the device. It is compact, constructed of high grade materials and in addition to being attached easily, is inexpensive.



Some New and Practical Accessories Which Will Appeal to the Operator, Owner and Manufacturer of Commercial Vehicles, Including Valve Lifter, Fuel Filter, Gasoline Gauge, Etc.

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MOTORS IN GERMAN ARMY.

It is stated that the German army now has 600 motor outfits, each comprising a tractor and trailer, having a total carrying capacity of six tons. This is estimated to be sufficient for the supply of rations and forage to at least 10 divisions at the rate of 60 tons a day.

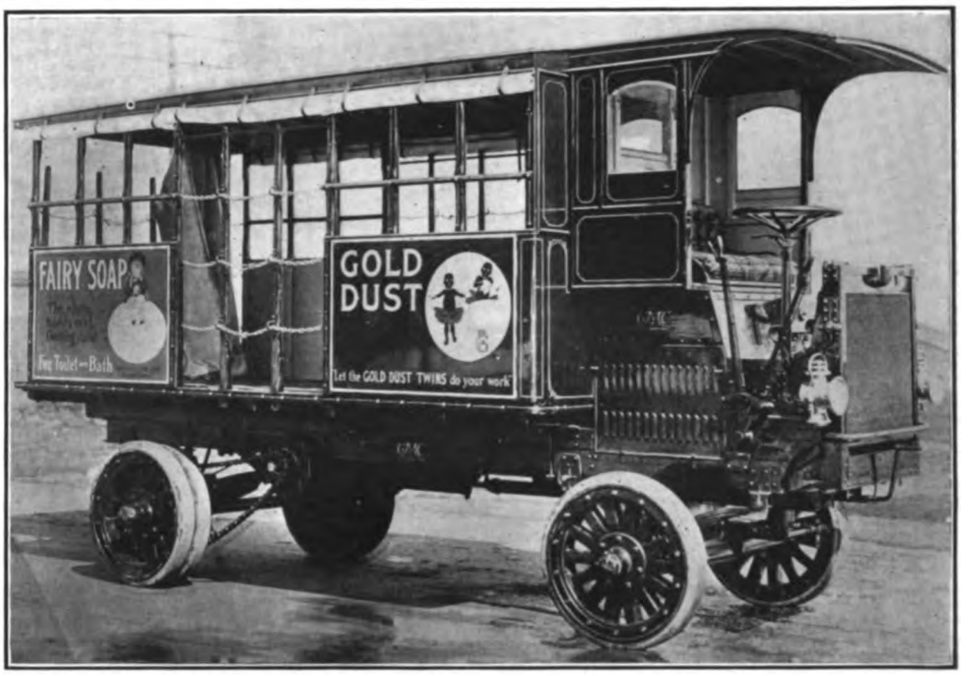
The Austrians are subsidizing similar outfits, but in view of the more undulating nature of the country there, each is intended to carry but five tons. This government recently conducted a very successful 1000-kilometer trial, in which 10 of these motors took part.

G. M. C. AND GOLD DUST TWINS.

Housekeepers throughout the country are familiar with the Gold Dust Twins, a product of N. K. Fairbanks & Co., Chicago, which concern utilizes the 3.5-ton G. M. C. truck, made by the General Motors Truck Company, Detroit, illustrated herewith. It will be noted that the machine is not only used for hauling, but it provides a valuable advertising medium, its sides having two panels on which are outlined the products of the company.

The machine is propelled by a four-cylined, four-cycle, water-cooled motor, having a five-inch bore and stroke and rated at 40 horsepower. The power plant is demountable. Cooling is by cellular radiator and ignition is double, with two sets of plugs, current being furnished by a Mea magneto and storage batteries. A ball type speed governor is fitted to prevent the operator from overspeeding the vehicle. A disc clutch is employed and the transmission is of the progressive type, affording three speeds forward and reverse. Final drive is by side chains.

Two sets of brakes are fitted, these being of the expanding and contracting type on the rear wheels, which are equipped with 36 by four inch dual solid tires. The front members are fitted with 36 by five-inch single solid tires. Semi-elliptic springs are employed in front and full platform at rear. The wheelbase is 138 inches. The driver's position is at the right with right hand control. The body is of the stake platform type with curtains, and the driver is fully protected against the weather by a cab.



G. M. C. 3.5-Ton Truck Utilized by N. K. Fairbanks & Co., Chicago, the Vehicle Serving as a Valuable Advertising Medium as Well.

AMERICAN TIRES IN EUROPE.

It is claimed that while Europe has been producing automobile tires for a number of years, the rubber tread type of non-skid pneumatics, so prevalent in America, is practically unknown there, except as it has been introduced by tourists from this country. That there is a demand for this type of tire is evidenced by the fact that several Continental dealers are seeking for agencies. One of these dealers, M. Adler of Amsterdam, Holland, was a recent visitor in this country and spent some time looking over the tire field. As a result of his investigations he has taken the agency for United States tires, made by the United States Tire Company, New York City.

Mr. Adler operates one of the largest automobile supply houses in Europe, the main store being located in Amsterdam and branches in Paris, Brussels and Birmingham, England. He will handle the entire United States line, including the new patented truck tire. In making his decision he absolutely disregarded the question of price, giving special heed to quality. He claims that while American tires cost more than the European product, the difference in price will be more than offset by the difference in service.

SANITATION AND HORSES.

According to Morris Grabowsky, sales manager of the Alden Sampson Manufacturing Company, Detroit, maker of the Sampson line and a constituent of the United States Motor Company, New York City, sanitary conditions would be improved greatly by a more extended use of the motor truck. He says:

"Statistics credit the cities of this country with using 4,500,000 horses and 200,000 mules. With all the precautions to keep the cities sanitary little progress can be made so long as such an army of quadrupeds parades in endless procession up and down the streets. The clouds of dust which sift above the pavements are not clean earth of the fields, but are filled with disease germs and lingering death. The expulsion of the horse would mean the disappearance of the house fly, by removing its chief breeding source."

VELIES SUCCEED HORSES.

It is surprising to note the number of teaming concerns operating from 100 to 200 horses in Chicago, who are placing orders for contract work. It appears that many of these companies have been a little skeptical about the operating costs of the two and three-ton trucks, but the Zipprich Teaming Company, one of the largest in the city, recently placed an order with the Velie Chicago Branch for a three-ton Velie, which will be devoted to caring for the work of Hart, Schaffner & Marx, the well known clothing maker.

R. T. Houk, for the past year connected with the sales end of the United States Motor Company, has resigned to assume the management of a large mill in Ohio, in which he has been interested for some time.

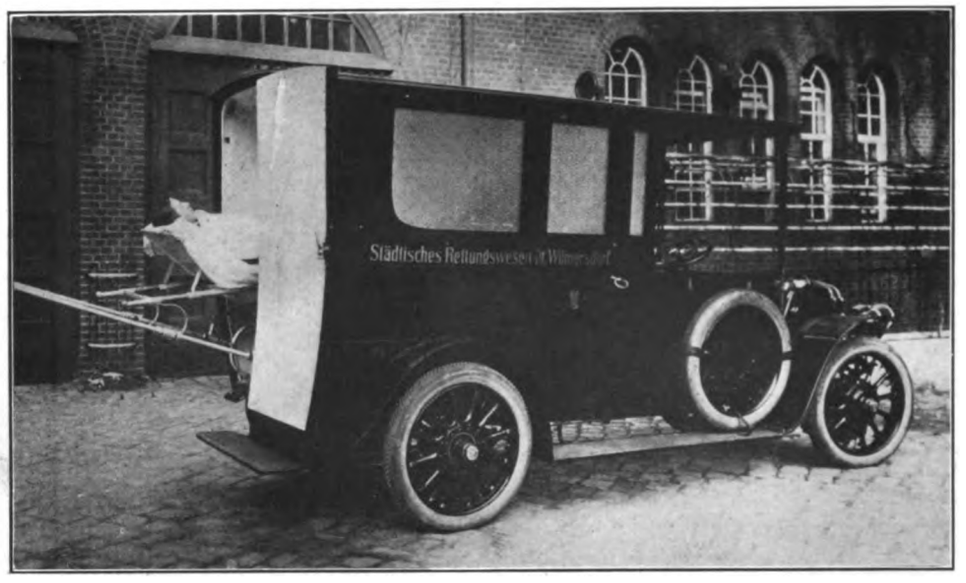
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FOREIGN TRUCK NOTES OF INTEREST

COMPETING WITH RAILROADS.

The recent coal strike in Great Britain served to recall the subject of long distance motor haulage, and the results which were obtained during the railway strike of last August. It is probable that the business men of England could not have secured a better demonstration of the value of industrial transports than during that period, and it is interesting to note that several sections of the British Isles are profiting by the experience gained at that time.

In Glasgow the demand for some new method of transportation has been very real, due to the fact that railway facilities in that portion of the country have been reduced to a minimum. The Glasgow Motor Carriers, a haulage company operating a considerable number of Halley vehicles, is engaged in the cartage of cement from that city to the Partick. It also hauls beer to Motherwell, a distance of some 12 miles; machinery to Wishaw, about 15 miles; stoves from Bonnybridge to Glasgow, and undertakes considerable other work of this character.



First Fire Department Ambulance Recently Installed in Berlin, Germany.

The same thing is true in a measure of Edinburgh, where the Scottish Motor Traction Company often is called upon to make trips between that city and Glasgow, a distance of 37 miles. Some attempt has been made to inaugurate similar service in different sections of England.

KISSELKAR IN JAMAICA.

A member of a large firm dealing in bananas in Jamaica recently returned from Baltimore, Md., bringing with him a three-ton KisselKar truck, made by the Kissel Motor Car Company, Hartford, Wis. This is said to be the first motor vehicle utilized in this work on the island, and the results were so satisfactory that a repeat order for two more machines of the same make has been forwarded to the United States. Other growers are considering the advisability of experimenting with commercial cars, and it is understood that American makers are to find decided competition from British products in the near future, one machine of English make having been ordered already.

MAIL MOTORS IN NEW ZEALAND.

During the past five years the New Zealand government has been employing Albion vehicles, made in England, to good advantage in connection with public service and mail contracting work. So satisfactory have these machines proven that a repeat order has been given for a two-ton vehicle which will be used exclusively in mail delivery.

GERMAN FIRE AMBULANCE.

The accompanying illustrations present the type of motor ambulance recently installed by the fire department in Berlin, Germany. This is the first vehicle of this character in service with a fire department in Germany, and it will answer all alarms, in exactly the same manner as any other piece of fire fighting apparatus. The object, of course, is to provide for the needs of the injured in a possible emergency.

It will be noted that the chassis follows standard lines and is equipped with pneumatic tires of liberal dimensions, thus affording easy riding qualities. The end view shows the interior, and provision is made for carrying at least two patients at a time. The side view indicates the method of placing the patient in the upper cot.

In many respects the vehicle differs materially from those produced in America. This is particularly true of the interior appointments, to which much attention has been paid in the United States. It will be seen that the door covers only a portion of the rear, and while opportunity is afforded for the surgeon to work upon the patient on the way to the hospital, entrance to the apartment is by no means as easy as with American ambulances. Evidently the Germans have something to learn in ambulance construction.

TRACTOR KEEPS BUSY.

An interesting experiment was tried with a Marshall oil tractor in Ireland recently, when the owner set it at work operating a four-foot circular saw, cutting oak and ash planks 20 inches wide, a chaff cutter and an oats crusher, at one and the same time. This work went on continuously for four hours, during which time the machine consumed three pints of gasoline, five gallons and two pints of kerosene and about two quarts of lubricating oil.

SUGAR INTERESTS SEEK MOTORS.

Several of the owners of sugar plantations on the island of Mauritius in the Indian ocean are interested in the availability of motor vehicles for hauling supplies and crops. It is pointed out that the climatic conditions require some special provision of protection from the heat, but in other

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respects it is anticipated there will be little difficulty in securing suitable transports for this service.

WANT TRACTORS IN AUSTRALIA.

Duncan & Fraser, Adelaide, South Australia, is agent for tractors, particularly of the agricultural type, and has succeeded in placing a number of these. However, it is understood that the farmers throughout this district are anxious to secure a light tractor of the internal combustion type, and manufacturers of this class of vehicles undoubtedly would find a good market in this section.

AGRICULTURAL TRIALS IN ALGERIA.

The directorate of agriculture in Algeria has arranged a competition for agricultural motors in that country from May 26 to June 15. Foreign manufacturers are invited to make entry, and applications should be addressed to the Directeur de l'Ecole d'Agriculture Maison-Carree, Algeria.

TASMANIA NEEDS TRUCKS.

Regular passenger motor service is being operated by two concerns in Tasmania, between Hobart and Launcestown, and it is said that both lines are well patronized despite the railroad communication provided. The success of these vehicles has led to a study of the problem on the part of the owners of some of the fine fruit growing ranches in that vicinity, and it is anticipated that a splendid market will soon be developed for motor trucks in the handling of this product.

SEPARATE SHOW FOR OLYMPIA.

As is more or less well known the people of Great Britain have been compelled to visit Manchester each year in order to acquaint themselves with the new things in commercial vehicles. There was an effort last year to plan a motor truck show in London, but the manufacturers frowned upon the plan. Arrangements are now being made for the 1913 show season, and it is regarded as practically certain that a separate display of industrial transports will be held at Olympia in London during the coming winter.

AGRICULTURAL MOTORS IN URUGUAY.

Plans are nearing completion for an international competition between agricultural motors in Montevideo, Uruguay, during the summer. The Associacion Rural del Uruguay has the matter in charge, and permission has been received from the government to admit all competing machines duty free. In addition the railroads have agreed to transport these vehicles gratis. The entrance fee is $50, gold, for each machine. The entry list was scheduled to close May 1, but as the competition is to extend until Oct. 1, it is probable additional time may be allowed.

OPENING IN THE FAR EAST.

Great Britain reports a large number of inquiries concerning the use of heavy motor vehicles in the Far East, and particularly in China. The roads are bad and the running costs are extremely high, as has been demonstrated with vehicles now in service, but there appears to be a growing demand for information upon the subject, and it would seem that the near future is to see a market for a satisfactory line of vehicles. Baily & Co., of Hong Kong, has undertaken the importation of chassis and parts, and expects to construct vehicles which will withstand the strains imposed upon them in this country.

POSSIBILITIES IN CEYLON.

The roads in Ceylon are hard and good and a number of motor vehicles are being utilized with satisfactory results. The following extract from the report of the director of public works should prove of interest:

"The roads from Badulla to Passara, Kumbalwellu to Ella, Nanta to Spring Valley and Bandarwela to Liyanguhawela have suffered a good deal from the wear and tear caused by the heavy tractors and trailers traversing them. The results of introducing tractors and trailers with steel tires and axle loads reaching in some cases four tons on an axle, clearly prove that the ordinary macadam surface, even though laid on a stone foundation, will not stand the wear and tear due to the continuous passage of such vehicles keeping to one track along the centre of the way. The increasing traffic throughout a greater part of the island doubtless points to the desirability of an improved system of transports, and the time is arriving when the metalled surface of the roads will require widening.



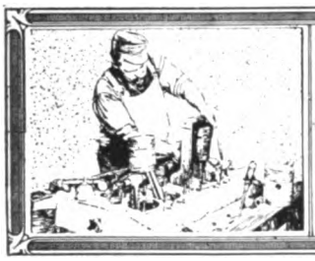
Interior Construction of New German Motor Ambulance.

"The government has recently ordered for experimental purposes a motor lorry, width five feet six inches over all, with wheels fitted with rubber tires, maximum axle load, fully loaded, not exceeding three tons, and hopes are entertained that vehicles of this type will not only be found suitable for use on many of the existing roads, but also that they will meet the reasonable requirements of the users of the roads."

SEEK AGENCY FOR SOUTH AFRICA.

A representative of a firm in Johannesburg, South Africa, has been visiting England for the purpose of securing an agency for a type of motor vehicle adapted to mining service. It is understood that the management of the mines at Wiwatersrand is extremely anxious to utilize industrial transports in the hauling of supplies and mining products, and those who are producing vehicles of this character would find an excellent market in this section.

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MECHANICAL NOTES AND TIPS FOR DRIVERS



WHEEL ALIGNMENT AND TIRES.

In view of the educational campaign being conducted by the manufacturers of tires to correct the evils and abuses to which solid members are subjected, a consideration of the causes of poor efficiency will prove of interest, both to the driver and the owner. The manufacturer has expended considerable sums in laboratory tests in an endeavor to discover the cause of complaint as well as to perfect the compound of the rubber.

During the early days of the commercial vehicle the maker was puzzled to note that while some tires gave satisfaction, others of the same make in service with the same company, developed what appeared to be serious defects. After much study and numerous tests it transpired that the majority of the complaints and tire failures were due to the fact that the shoes had been run on machines the wheels of which were out of alignment.

Operators of the pleasure vehicle watch their tires to note if they show signs of wear due to this cause, but the driver of a mechanical transport equipped with solid members is apt to be careless. This does not arise from a lack of knowledge but rather neglect in regularly examining the cars to ascertain if the wheels are lined up.

It is said that it is a common experience for tire makers to receive a complaint that, with a vehicle on which their shoes have given excellent results, new tires have collapsed at the end of 1000 miles or so, and an examination has, in the majority of cases, proved that owing to some accidental cause, the wheels have been thrown out of alignment. A company manufacturing pneumatics only, issued a pamphlet on this subject recently in which it was pointed out that misalignment of tires reduced their efficiency about 90 per cent. and it is safe to estimate that the value of a solid tire is affected at least 50 per cent. The effect upon the material varies. In most cases the rubber will wear away evenly, but with such rapidity that it is quickly noticed by the driver. In other instances flats are worn on the surface of the tire, creating an impression that the material utilized in its construction is of varied quality.

Effect of Misalignment.

The effect of wheels out of alignment may be realized by taking a couple of coins in the fingers and rolling them along a flat surface keeping them perfectly upright and parallel. It will be noticed they revolve quite easily, but if the coins be set at an angle to each other, although in a vertical position, a considerable amount of side pressure will be noticed. This is what takes place when the wheels of a commercial vehicle are offset or inset from the parallel. The experiment will also convey some idea of how damage to tires is caused when fitted to wheels that are out of alignment, especially front members, as these more frequently suffer from this defect.

As the wheels are always held the same distance apart on the axle, a continual grinding action takes place at the point of contact with the road, this wearing out the tires considerably quicker than would be the case were the wheels perfectly parallel. The extent of the wear may be realized by a simple calculation. If the wheels were offset to the extent of only one inch out of the parallel in a diameter of 32 inches, they would, if free to separate, be over three miles apart at the end of a test of 100 miles. The wear may be illustrated by holding coins against a true grindstone, first parallel and then set at an angle. In the first case the coins will revolve freely without suffering any apparent damage, but when inclined the grinding action will wear away the metal all around the rims.

Among the principal causes of wheels becoming out of parallel are: Violent contact with curbstones and carelessly running over large obstructions in the road. Undue lost motion in the bearings of the wheels and steering mechanism are also largely responsible, and whenever there is an undue amount of play steps should be taken to remedy the defect, otherwise damage to the tires is inevitable. Lost motion in the steering gear is the chief cause of flats wearing around the tread of the shoe, this being brought about by the constantly altering direction, unevenness of running, and the twisting effect at the point of contact with the ground. Misalignment is not confined alone to the front wheels, as the rear members may be affected, although this condition is the exception rather than the rule.

Testing the Wheels.

The garage, whether it contain one or a fleet of automobiles, should be equipped with some device for constantly testing the alignment of the wheels and a measuring member may be constructed easily from two pieces of stiff wood battens which should be about 1.5 or two inches square and about nine feet long. In the ends of these members small holes are drilled and two equal lengths of string, cord or twine inserted therein. Care should be taken to make the holes in the wood equidistant, and the ends of the twine in being passed through the holes should be knotted and secured in a suitable manner, so that there will be no variation in the lengths of the cord.

The wooden members should then be placed over the backs of two chairs or suitable rests, so that the lines of string are adjustable in a straight line along either side of the machine. The front wheels should then be jacked up clear of the ground, and the wooden strips adjusted so that the twine on one side is dead straight and equidistant from the edges of the flanges or rims of the front and rear wheels. As there is sometimes a difference in the width of track of the back and front wheels, the actual distance of the twine from each wheel may not be the same, but this is of no great consequence so long as the same difference exists on the opposite side. It is important, however, that special precaution be taken to see that no difference exists on the distance fore and aft of the diameter of each particular wheel. Having made this adjustment, measurements should be taken of the corresponding positions of the wheels on the opposite side, and should there be any variation, it is obvious that the wheels are not parallel and require attention.

Correcting the Faults.

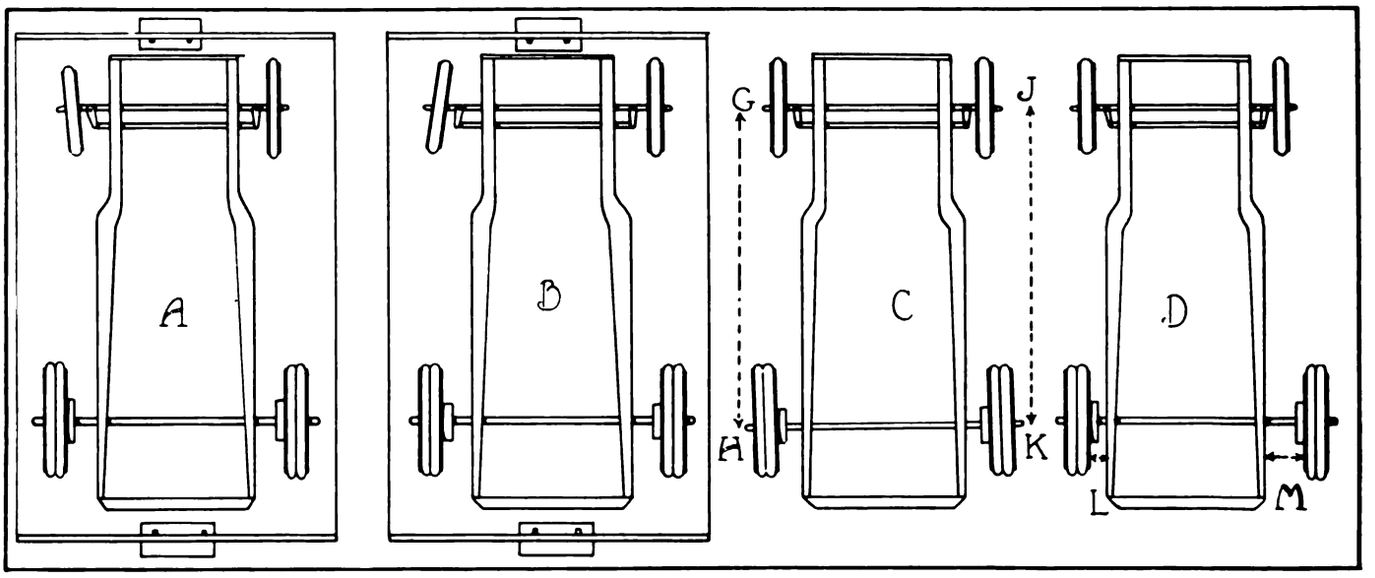
The chief irregularity noted in this test will probably be that one of the front wheels is out of alignment, as indicated at A or B in the accompanying illustration. To correct this fault the tierod should be lengthened or shortened, according to whether the trouble is in front or back of the axle. The tierod is usually provided with an adjustment sleeve by means of which the misalignment may be

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rectified. If not the rod will have to be removed and remedied. The cost of an adjustment member is slight and should be fitted. The wheels should be adjusted so as to be parallel when they are thrust outward in front as far as any slight play in the steering mechanism will permit, as the forward movement of the car along the road tends to keep them in that position.

It may be that the rear wheels are not aligned; that is, not parallel, and if so it may be caused by a violent collision with some object which has bent the axle. The axle should be removed and repaired, after which the wheels should be tested. Another cause of misalignment is depicted at C and is usually the result of displacement or unequal adjustment of the radius rods. It may be quickly discovered by setting the front wheels parallel with the chassis, then measuring the distances between the ends of the axles and string as indicated at the points G and J on the one side and H and K on the other. These distances should be alike in both cases.

A serious instance of displacement is noted at D and this is detected by measuring the distances from the inside of the rim of the wheel and the chassis frame at points L and M. An examination of the wheels for misalignment should be made every day or at the least as often as once a week, and a more complete test, back and front, at least once a month. By observing these precautions the life of the tires will be augmented and the upkeep of the vehicle reduced thereby.



Depicting the Effect of Misaligned Wheels upon Tires, and a Simple Method of Testing the Members: A, Front Wheel Badly Out of True; B, Similar Condition with Wheel Inset; C and D, Illustrating Unequal Adjustment of Radius Rods and Displacement of Rear Axle.

A SIMPLE WRENCH KINK.

In the event of an adjustment being necessary upon the road and the tool kit is not equipped with the proper sized S wrench, and an ordinary monkey wrench cannot be employed, one of the former type but slightly larger may be utilized by placing a strip of thin metal between the nut to be worked and the jaw of the tool. A few pieces of an old hacksaw blade or metal will prove handy as with these an odd sized nut may be removed or tightened with a standard tool having a larger opening.

WATER IN ACETYLENE PIPES.

Where generators are employed to furnish acetylene for the headlights and the flame flickers, the disturbance as a rule may be laid to water in the pipes. Some types of generators are troublesome in this respect and the only cure is to get a new one or fit the piping system with a trap. The latter may be constructed from a drop elbow. One opening should be closed permanently and the other fitted with a plug. The pipe leading from the generator is cut at its lowest point and the trap inserted in the line by drilling two holes in the elbow and soldering the tubing. Being at the lowest point of the tubing the moisture will collect and may be drained by removing the plug.

PEERLESS WORKS DAY AND NIGHT.

A demonstration of the earning capacity of the commercial vehicle is noted in Fall River, Mass., where a three-ton Peerless truck, made by the Peerless Motor Car Company, Cleveland, O., has been in service day and night for over a year. The machine is employed by the M. Sweeney Company, and two shifts of men are employed. In the daytime it is utilized for general trucking and moving household goods. On Sundays, in the summer, passenger seats are fitted and excursionists are carried to the beaches, etc. During the strawberry season it has regularly carried two truck loads every night from Fall River to Providence, R. I., and the car is used frequently for transporting freight. It has left Fall River at 6 in the morning and taken a heavy load to Lynn, Mass., and after covering 120 miles was back in Fall River at 7 in the evening. It has frequently covered 200 miles in 24 hours. The machine is fitted with a special convertible body. The sides and top are removable and the latter is adjustable to height. After covering 9100 miles the tires were renewed. So well pleased are the owners that a repeat order has been placed with the Peerless Motor Car Company.

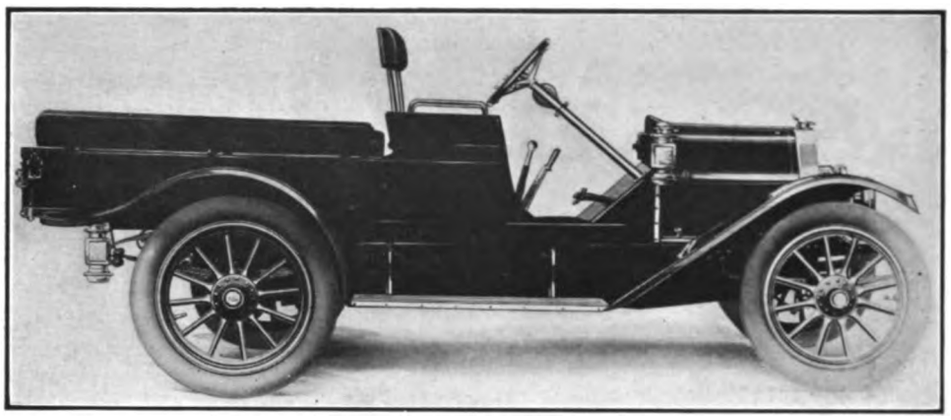
MARKET IN SOUTHERN NIGERIA.

It is understood that the people of southern Nigeria, British Africa, are anxious to develop the back country by the utilization of motor wagons. The difficulty of getting goods conveyed to stores located at a distance from the coast is very considerable under the present methods, and it is thought that by cutting a track through the brush it would prove possible to reduce the cost of transportation very materially.

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OVERLAND LIGHT DELIVERY WAGON FOR 1912.

INCREASING interest in the light delivery motor vehicle for all classes of service for which such wagons are available, has resulted in the production of numerous models within the past few months. Among the makers devoting their attention to this class of work is the Willys-Overland Company, Toledo, O., maker of the well known Overland line, which brought out a vehicle of this type last year. In making its announcement for 1912, however, it develops that the Overland light delivery is much more interesting than the older design in many ways.



Overland Model 59 Express Light Delivery Wagon for 1912.

It will be remembered that the 1911 model was fitted to a 25 horsepower chassis, the motor having a bore of 3.75 inches and a stroke of 4.5. The transmission was of the improved planetary type, two speeds forward and reverse. Other features differed materially from what is offered in the new chassis.

Two views of the 1912 model are shown herewith, that equipped with an enclosed body being known as the 59 Special, while the other is to be termed the 59 Express. Both are designed to meet the varying requirements of a wide line of purchasers. The Special is easily accessible from the rear, two large doors, extending the full height, being fitted. The Express also is of ample dimensions, and each is handsomely finished, the former in maroon with black trimmings, and the latter in Overland blue and gold. As has been indicated, the chassis is the same for both models, and is rated at 800 pounds.

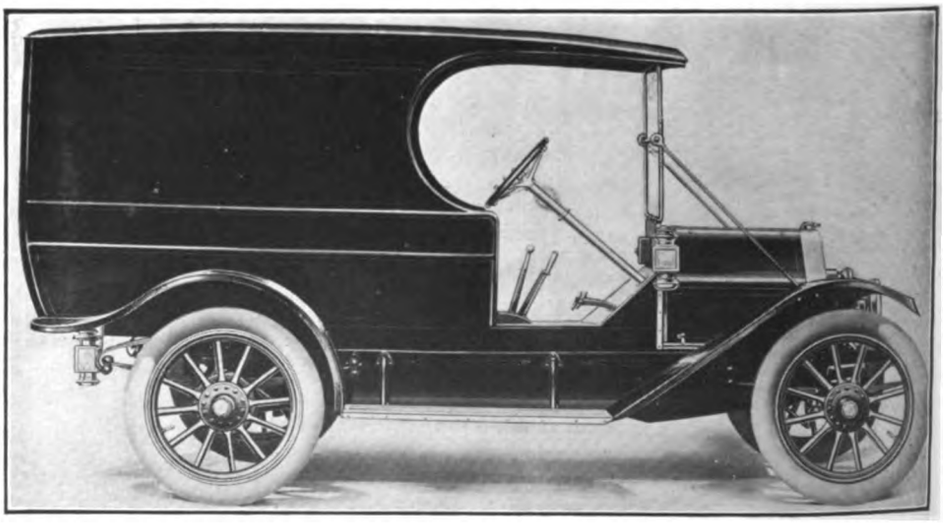
The reputation of the Willys-Overland Company in the production of pleasure automobiles is too well known to need comment. It is sufficient to say that the same careful workmanship and attention to detail is evidenced in the construction of the light delivery wagon. The best of materials is utilized throughout, and particular endeavor has been made to produce a vehicle which shall withstand severe usage.

The motor is a four-cylinder, four-cycle, water-cooled unit of the L head type, with all valves on the left hand side, where they are operated from a single camshaft with integral cams. The cylinders are cast separately of a high grade gray iron and are arranged vertically under a hood. The bore is four inches and the stroke 4.5, giving a horsepower that is rated conservatively at 30 by the maker. The speed range is from 4.5 to 50 miles an hour, and extended tests have demonstrated that the car will operate successfully on an average of 20 miles to a gallon of fuel.

All pistons and rings are accurately ground to size and fitted with extreme care. The cylinders are supplied with ample water jacketing surface, and particular attention has been paid to the matter of cooling, which is by thermo-syphon. The radiator is of the honeycomb tubular type, supported on either side by trunnions which take up all road stresses. The special design is with reference to securing the minimum amount of wind resistance. The six-bladed adjustable fan is hung from an arm of the crankcase, extended upward and is driven by belt from the crankshaft. The maximum temperature of the water is held by the maker to be 198 degrees.

The crankshaft is of a special grade of alloy steel, hardened and ground. The bearings are of liberal area, five in number, plain, die cast, and very accurately fitted. Extreme care has been taken in the matter of fitting the inlet and exhaust manifolds, to permit the easy ingress and egress of all gases. The camshaft is of a selected quality of steel, fitted with three bearings of the same material and design as those of the crankshaft. The camshaft is hardened and ground to limits, thus insuring the size of the bearings and the certainty of valve timing.

Lubrication is by a force feed oiler to the cylinders with constant level splash in the crankcase. The system has a capacity of one gallon. Ignition is by jump spark, utilizing a Splitdorf dual magneto and dry cells. The carburetor is of the float feed type, and the design has proved very efficient in service. The gasoline capacity is 14 gallons. Ignition and carburetion are controlled by levers located on the steering post.



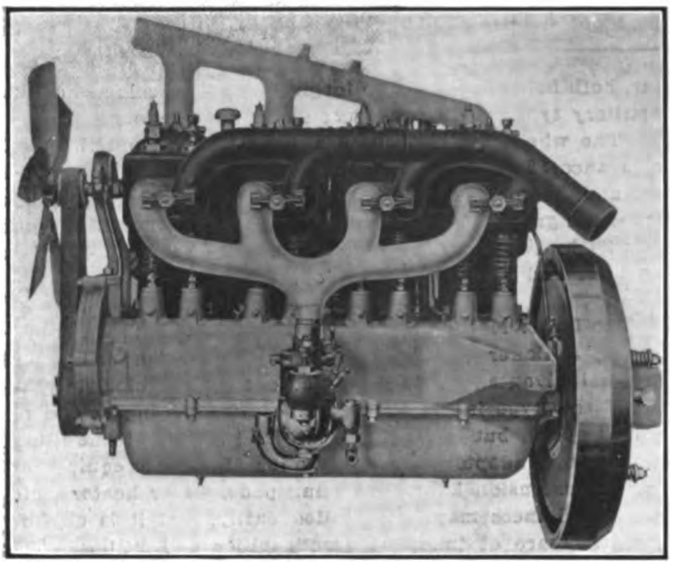
Overland Model 59 Special, a Satisfactory Utility Vehicle.

The clutch is a cone member with a woven asbestos and wire facing which is heat proof and will not char. This en-

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gages with the cast iron inner surface of the flywheel.

The transmission this year is selective, permitting three forward speeds and reverse. The following gear ratios are provided: One to one for the high, 1.55 to one for the intermediate, 2.57 to one for the low, and 3.3 to one for the reverse. This is located as a unit with the rear axle system, and F. & S. annular bearings are employed throughout. Drive is by shaft, through the torsion tube to the bevel gear on the live rear axle, which is of the semi-floating type and equipped throughout with Hyatt roller bearings.



Left Side of Overland 30 Horsepower Motor.

The frame is of channel section cold rolled steel. The front springs are semi-elliptic, 36 inches length and 1.75 inches width, while the rear members are three-quarters elliptic and of the same dimensions. The front axle is an I beam section, drop forged, the wheels running on ball bearings. Service brakes are expanding on the rear hub drums, controlled by pedal; the emergency members, contracting on the rear wheels and controlled by lever. The brake drum diameter is 10 inches with a width of 2.5625 inches.

The wheelbase this year is 106 inches, as compared with the 102 inches of 1911. The tread is 56 inches. Wheels are of the artillery wood type, with 12 1.5-inch spokes and 12 bolts to each wheel. Tires are pneumatic, 33 by four inches, all around.

Special mention should be made of the control system. It will be noted from the accompanying illustrations that the central position of levers is favored, this being of particular interest to the operator of a delivery wagon, where it is desirable to have easy access to the driver's seat from either side of the vehicle. The steering post is on the right. This is fitted with a worm and gear type of steering mechanism and a 16-inch laminated wood hand wheel. The gears operate on plain bronze and ball thrust bearings, and the steering knuckles are of Tobin bronze, eliminating all danger from leakage.

Every effort has been made to provide for a satisfactory delivery wagon from every viewpoint. To this end the dimensions of both bodies are very liberal. The length of the floor in the Special model is 60 inches, and the width 43. The height from the floor to the top is 53 inches. This is sufficient to permit of carrying a full load of light weight products, and makes the car particularly desirable by florists, grocers, jewelers, etc.

In the Express, the length of the floor is 67 inches and the width 42. The height of the sides is 10 inches, and the width of the side wings six inches. The utility of this equipment will be apparent to those who are seeking a wagon designed to provide ample carrying capacity for all classes of merchandise.

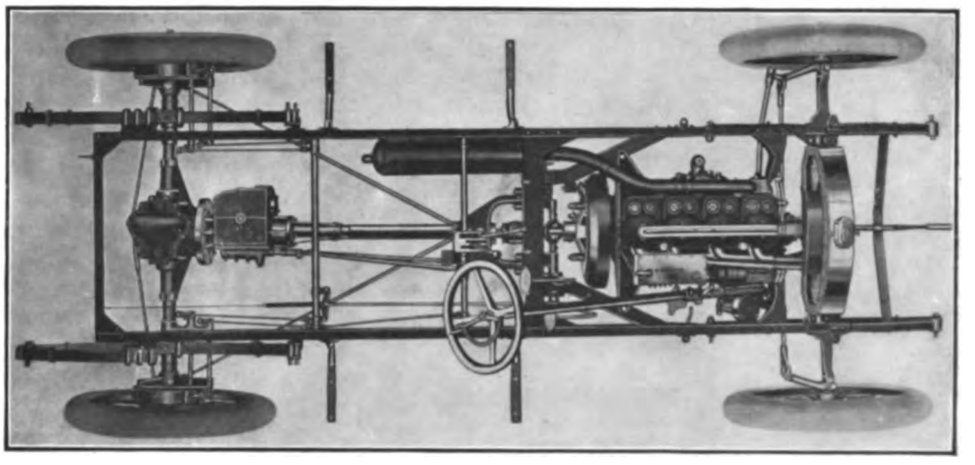
With each of these bodies, the company furnishes two gas headlights, two oil side lamps and one oil tail lamp, generator, full set of tools and tire repair kit. There is little doubt that both of them will meet with ready acceptance by a large number of concerns who have been awaiting the arrival of a light delivery wagon with plenty of reserve power and designed to meet every need.

INTRODUCING MOTOR PLOW.

California farmers are being converted to the use of motor propelled agricultural implements, the Hackney Manufacturing Company, St. Paul, Minn., maker of Hackney plows, having established a Pacific Coast branch at Los Angeles. The plow is the invention of Leslie S. Hackney, president of the company, and is 14 feet in length and six feet five inches wide. It is equipped with a four-cylinder, four-cycle motor, having a five-inch bore and six-inch stroke, and its maximum is obtained at 800 revolutions a minute. The machine can be utilized for many purposes. By means of a side lever the blades may be raised clear of the ground and the device employed as a tractor. It also can be used to saw wood and perform numerous other duties about the farm. The plow is being demonstrated to the farmers.

GOODYEAR TIRE PRODUCTION.

In celebrating its birthday recently, the Goodyear Tire & Rubber Company, Akron, O., maker of Goodyear tires, enlarged its production facilities so as to increase the daily output of 4000 tires to 5000. This has particular reference to the shoes for pleasure vehicles, but it is interesting to note that the concern is now manufacturing between 400 and 500 solid motor truck shoes a day. This means that during the year 1912, 7,500,000 pounds of material will be needed to meet the requirements of this concern in this particular field. The daily output is sufficient to equip 150 vehicles. C. W. Martin was recently appointed manager of the motor truck department of the company.



Overland Light Delivery Chassis Is Remarkably Simple in Design.

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ELECTRIC VEHICLE BREVITIES

The value of the light capacity electric delivery wagon is conceded by a large number of department stores, who have installed this type of vehicle. The usual method has been that of thoroughly testing out one or two cars, and when these have had opportunity to demonstrate their practicability increasing the equipment along lines which experience has dictated is best.

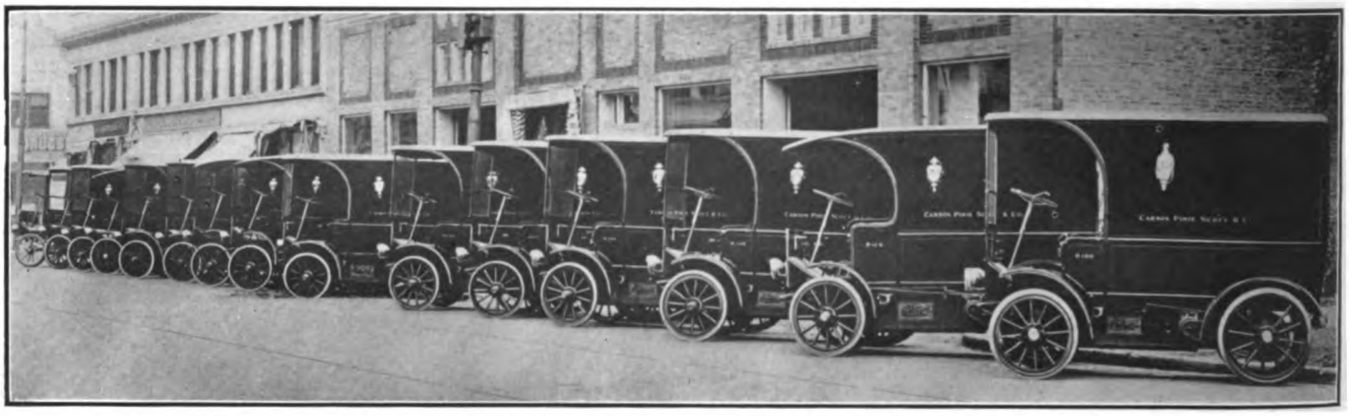
In an accompanying illustration is presented 15 of the 22 1000-pound Detroit electric wagons, made by the Anderson Electric Car Company, Detroit, in service with Carson Pirie Scott & Co., Chicago. This fleet has been in operation for more than a year and has given entire satisfaction in covering various routes. These 15 are garaged in South Chicago and operate in that territory, while others are stationed in Evanston and Highland Park. A few of the machines owned by the company are of one ton capacity. The entire fleet handles merchandise brought to the respective territories by larger cars.

The light vehicles are equipped with Edison 60-cell batteries; in fact, it may be stated that this type of battery is used exclusively in the Detroit electric cars. The motor is the firm's own make, a series wound type, in which varied load and road conditions are handled without undue increased current consumption. Copper and iron are used in such quantities as to withstand overloads for long periods without excessive heating. The brushes are well mounted and of liberal area. The normal voltage is 70 and the ampere rate 30 at 1300 revolutions a minute.

The controller is of the continuous torque, drum type, also made by the Anderson company. Plenty of contact area is afforded, the contact fingers being held under tension by laminated springs. The reverse switch is of the improved laminated type, mounted with the controller. An interlocking device of simple construction eliminates the possibility of the driver "bucking" the motor, it being necessary to bring the controller to a neutral position before changing the current direction. Oilers are provided at all important points.

The expanding band type of brake is employed, both on the wheels and countershaft. Springs are semi-elliptic front and rear, resting on large dimension axle seats, through which are drilled holes for the clips. The frame is of channel, angle and T steel. All joints are hot riveted. Sheet steel is used for the battery and motor compartments, this being riveted to the frame members and battery supports. The front axles are I beam, and the rear rectangular, both being special drop forgings. All wheels are of the artillery type, made from second growth hickory.

The wheelbase is 80 inches, the tread 56 and the road clearance 12. The length of the body is 129 inches, width 66 and height, 90, the platform being located 30 inches from the ground. Tires are solid, 32 by 2.5 inches in front and 34 by two inches in rear. The rated speed is 14 miles an hour and the mileage, loaded, about 50.



A Portion of the Fleet of Detroit Electric Light Delivery Wagons Owned and Operated by Carson Pirie Scott & Co., Chicago.

The Baker Motor Vehicle Company, Cleveland, O., is producing a Baker electric ambulance, for which is claimed unusual advantages. It is pointed out that an electric vehicle of this type is not only capable of travelling at the required speed, but is sanitary, safe and silent. In addition, it is readily adaptable to all manner of electric equipment, such as extension lamps, warming pads, water heaters, etc. Such appliances may be installed easily, and it is obvious that they are of immense practicability and utility. The current which they consume is inconsiderable and may be supplied from the battery which runs the car.

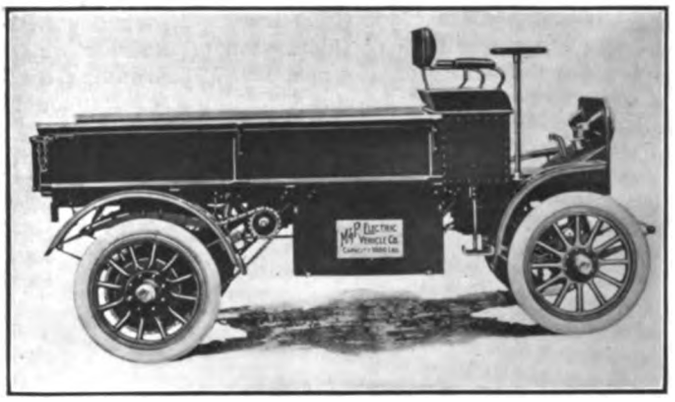
When equipped with pneumatic tires, the Baker ambulance has a speed rating of 18 miles an hour. The body rests on a 1000-pound chassis. The interior arrangement is such that two patients may be carried at a time, with plenty of room for two attendants. One patient is placed on a rigid frame cot which rests in a runway on the floor, while the other may be carried in a stretcher suspended from a unique spring hanger. The interior finish is in white enamel, and all cracks and crevices in the floor and sides have been eliminated to facilitate proper sanitation.

The Continental Car & Equipment Company of Highland Park, a suburb of Louisville, Ky., has an electric motor truck proposition under consideration. As a matter of fact it has two cars in operation. The first model was a three-ton vehicle which left the shops a short time ago. This is being tested out with a view to interesting capital, and it is intimated that it may be decided to manufacture the product in one of the cities in the East. Much interest has been aroused in the plans of the company, because of the fact that it is well known as a producer of contractor's dumping cars, now in use in all parts of the world.

The M & P Electric Vehicle Company, Detroit, Mich., is a new concern which brought out a 1000-pound car during the recent Chicago show. The concern has capital of $50,-

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000 and the officers are: President and general manager, Charles L. Pepper; treasurer and sales manager, M. C. Merriman; secretary, Burton Grandy. The product is presented in accompanying illustrations, one of which shows



The New M & P 1000-Pound Vehicle Produced in Detroit.

the chassis equipped with an open express body and the other with enclosed delivery.

The motor, an 80-volt Westinghouse unit, is located well forward, the drive being through a propeller shaft to a countershaft through the usual bevel gears enclosed in a housing which also contains the differential, and thence by side chains to the rear wheels. In order to make use of the propeller shaft the battery, a 40-cell Gould, is divided, each section of 20 cells being enclosed in its own box and hung on either side of the car. The location is such with reference to the mudguards and other parts of the machine, that nothing interferes with easy access to the boxes for removal and replacement of cells.

The controller is almost directly over the motor, which is under the seat, and as the battery boxes also are close to the motor, all wiring is short. In addition this makes for easy location of the fault, in case trouble should occur. The motor is readily accessible through the floorboards and the controller through the front boards of the seat.

The main chassis frame is of three-inch channel steel with ends and cross pieces of the same stock. The springs are semi-elliptic front and rear. Both axles are of Weston-Mott manufacture, the front member being I beam and the rear, square forged shaft. The jackshaft also is a Weston-Mott. Wheels are 32 inches in diameter, built according to the S. A. E. standard and fitted with three-inch solid tires. Pneumatics may be had as an option, however.

The wheelbase is 100 inches and the tread 56. The loading space with the express body is 80 by 42 inches and with the enclosed body, 80 by 42 by 56. The rated speed is 12 miles an hour and the mileage 50.

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The combination of the old Electric Vehicle Company of Louisville, Ky., with the Kentucky Wagon Manufacturing Company of that city, under the terms of which the former concern becomes the electric truck department of the latter, is expected to result in a rapid development of the Urban 1000-pound car made by it. Henry B. Hewitt, president of the Electric Vehicle Company, becomes general manager of truck department. Louis Ruthenburg, superintendent and engineer, and W. C. Knopf, electrical engineer. In addition to the car named, plans are now under way for the construction of three new models which will be rated at one, two and 3.5 tons, respectively.

The present capacity of the plant is 150 cars a year, but the company stands ready to increase the equipment and enlarge the capacity as the demand is developed. This is only one of the advantages of the combination, however, inasmuch as the Kentucky Wagon Manufacturing Company, before its absorption of the electric truck concern, had begun to specialize in the production of motor truck bodies of all types. This will give the purchaser unusual facilities for securing that which will best meet his needs.

Among the features which have been added to the Urban wagon are several devices which are calculated to extend its field of usefulness. These include a blower, a pump, incandescent lamps and other equipment operated by current from the batteries of the car. For emergency work, such as is undertaken by the Kentucky Electric Company of Louisville, which owns one of these vehicles, involving the entrance to manholes, which frequently are filled with noxious gases, the car promises to be invaluable, as it can be utilized to blow out the foul gases, light up the working spaces, etc.

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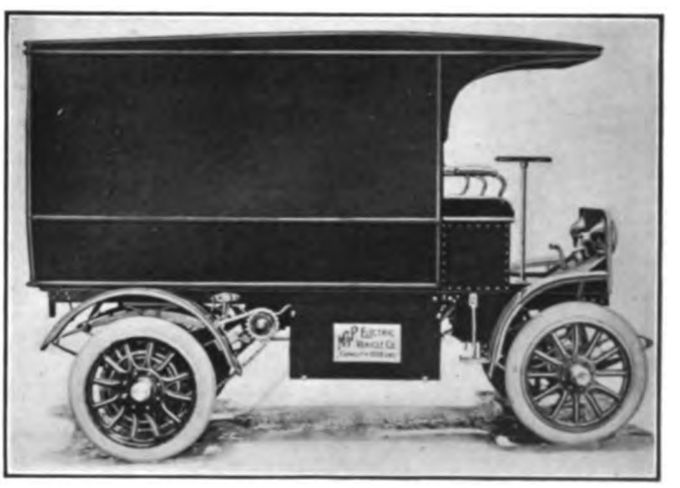
C. L. Morgan, sales manager of the electric division of the General Motors Truck Company, Detroit, maker of G. M. C. cars, recently superintended an electric vehicle test which will compare favorably with any devised by makers of gasoline machines. During one of the heavy snowstorms of early April, one of his men drove a three-ton G. M. C. truck from Pontiac to Detroit, carrying a full load and running within 20 per cent. of its full rated capacity. The roads were in decidedly poor condition, and the snow was drifting badly, piling up in some places as high as three feet. Despite these difficulties, the truck made good time and covered 26 miles.

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Those concerned with the delivery of United States mail are becoming more and more convinced of the special advantages presented by electric wagons. Those which have been placed in service in many cities throughout the country, have demonstrated their efficiency under every test, and it appears to be a foregone conclusion that the Post-office Department will decide upon the extension of their use as opportunity affords. It is not so much a question of load or mileage capacity which interests government officials in this field, but the most essential feature is the ability of the electric to start and stop readily. In the collection of mail it is necessary to make frequent short stops, and there is a real demand for a car which will be certain to start at once without cranking and other tedious preliminaries.

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Upon recommendation of Julien A. Halford, a well known English engineer, H. G. and F. G. Sharp of Toronto, Can., practically have decided to inaugurate a motor 'bus



M & P Electric Chassis Equipped with Enclosed Delivery Body.

service in that city. It is understood that the type of vehicle determined upon is a double-deck electric car with seating capacity for 50 persons. The plans call for the purchase of no less than 50 machines.

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The General Vehicle Company, Long Island City, N. Y., maker of G. V. electric trucks, has been studying some of the reasons for the large installation of its vehicles, included among which may be mentioned the 21 operated by Tiffany & Co., New York City, which have been in use 10 years; the 50 owned by the Anheuser Busch Brewing Company; the 48 belonging to the Peter Doelger Brewing Company, which has the finest reinforced concrete electric garage in the world; the 72 operated by the Jacob Rupert Brewing Company; the 38 owned by the R. H. Macy Company, and those numbering 100 or more in service for the Adams Express Company and the American Express Company. It finds the answer in the single word, "simplicity." The investigation is summed up as follows:

"One of the potent reasons for the success attending the introduction of the electric truck is its extreme mechanical simplicity. A simple series wound motor, practically of the same character as those used in the street cars of every city and town, is used to drive the vehicle. A Morse silent chain conveys the power to the countershaft, and roller chains to either side carry the power to the rear wheels. So simple is this power plant that it is seldom, almost never, out of order.

"A small lever is pushed forward by the driver's left hand, and the car moves forward; the further forward it is pressed, the faster the truck goes. To reverse the vehicle, the lever is pressed back, and the car run backwards. The steering wheel and post are rugged and simple. A pinion and sector give motion to a bell crank which through rods operates the steering knuckles on which are the front wheels. The whole operation is so simple that a teamster who understands the rules of the road, makes an efficient driver after a few hours' experience.

"Another, and perhaps one of the greatest reasons for the success of the electric vehicle, ranking second only to the improvements in construction, is the intelligent way in which it is sold. In the past they were sold to anyone who wanted to buy, and for any class of work. The result was many impractical applications. Today the selling engineer looks over each proposition, and if one is presented that is not practical for the electric to handle, the customer is advised to use horses or some other form of motor vehicle.

"This leads to the suggestion that the transportation superintendent should cease to think of the electric as a competitor of the gasoline driven machine. The true efficiency of the latter commences where that of the electric ceases. The electric should not be sold for the gasoline work, the long, straightaway hauls with few stops, nor should the gasoline be placed in the electric truck field, the short and medium runs with many stops. Whenever either form is operated in its wrong sphere, failure is sure to result."

★

The Baker Electric Company of Michigan was incorporated at Detroit, April 3, with the following officers: President, J. Caldwell Walker, Detroit; vice president, R. C. Norton, Cleveland. O.; secretary and treasurer, William C. Burnett, Detroit. This is to be a direct factory branch of the Baker Motor Vehicle Company, Cleveland, O., maker of Baker electric cars. The new salesroom will be located in the heart of the automobile district on Woodward avenue, and a complete line of pleasure and commercial vehicles will be carried.

★

William H. McLellan, a salesman at the Boston branch of the R-C-H Corporation, Detroit, recently took a 1000-pound Hupp-Yeats delivery wagon over the road from Providence, R. I., to Boston, carrying a load of 750 pounds, in 4:15:00. The distance covered was 52 miles according to the speedometer. In many respects this was a remarkable demonstration.

While it is generally conceded that the legitimate field of the electric is in city and suburban work, it will prove of interest to note that this trip was over country roads, some of which were of macadam it is true, well supplied with hills and in a condition at this season of the year which would tax the ability of any machine. The running time is worthy of comment as well. The Hupp-Yeats undoubtedly will meet with decided favor in New England, if it is able to make such trips with reserve energy, as is said to have been true in this instance.

★

"That the gasoline chassis is popular today," says C. L. Morgan, sales manager of the electric vehicle division of the General Motors Truck Company, "isn't to the discredit of the electric. They both have their distinct fields, but do not think for a minute that the electric truck makers have not been progressive, for they have worked just as hard to secure the serviceable vehicle as the other branch of the industry.

"Their popularity will increase with a better knowledge of their advantages. Take for instance the G. M. C. electric, embodying as it does, two features that are as important mechanically as any improvement made on a gasoline chassis. We have eliminated the chain which is commonly used for the first reduction from the motor to the countershaft.

"Another vital point in the electric chassis construction is the position of the batteries. We have placed them where they are accessible, above the frame and under the driver's seat. This location eliminates time, labor and the trouble of disconnecting and drawing out the batteries for inspection, and the difficulty of caring for them through trap doors in the floor."

★

The General Vehicle Company, Long Island City, N. Y., announces that its plant is now working to full capacity and the construction of a new factory is under advisement. Over 100 G. V. electric trucks were shipped during April, and there are many orders on hand for delivery as late as next November. Prospects are also bright for many new orders from all sections of the country, and some of these are expected to reach as high as 30 from new customers.

The bulk of the General Vehicle business, however, comes in the form of repeat orders. The company is now reaping the reward for standardization and conservative selling methods put in force five years ago. That it pays to have high standards in building and selling motor trucks is evidenced by the growth of this pioneer manufacture. It is held by this concern that it is better to sell two trucks to a customer and have them adapted to his work than to make sales indiscriminately and secure few if any repeat orders.

TRUCK REPLACES SPUR TRACKS.

The Groton & Stonington Street Railway Company, Groton, Conn., is planning the purchase of a truck for the purpose of making deliveries from its express cars, this being necessary owing to a rapidly increasing business. The company handles considerable freight for manufacturing concerns and the latter have requested the building of spur tracks to their plants. By installing a machine for this work it is figured that considerable expense may be saved and the service improved. It is proposed to run the automobile to Mystic in place of the usual cars. A trial was given of an automobile and the demonstration was successful in every particular. The installation of such a service will be a great benefit to the business men and other patrons.

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RECENT MOTOR VEHICLE PATENTS

De Fazi Piston.

Fulvio De Fazi, Providence, R. I., assignor of one-half to William D. Blossfield, has been granted a patent for a gas engine piston, which presents unique features inasmuch as it dispenses with the usual wristpin. The head of the piston carries a thrust block which engages with the ball end of the connecting rod. The block is adjustable, being screwed into a larger, similar member and is provided with a set screw, the purpose of which is to take up lost motion. The ball and socket members are lubricated by means of an oil duct which leads from the side of the piston to the top of the ball portion of the connecting rod. It is claimed by the inventor that perfect alignment is secured and that wear upon the walls of the cylinders and piston rings is reduced to a minimum by the ball and socket device.

Buffum Oil Can Holder.

Frank Washburn Buffum, Louisiana, Mo., has been granted a patent for an oil can holder which comprises a metal base having integral jaws and carrying a boss and lugs on the underside. A pivotally mounted jaw is fitted which exerts a downward pressure, forcing the member into engagement with the lower edges of the font of the oil can. The latter is engaged or released easily, the inventor claims.

Larkins Muffler.

Herman H. Larkins of Princeton, Ky., has patented a muffler which differs from those of usual construction, inasmuch as the device is made in two sections. It consists of two cylindrical members with ends closed, with the exceptions of the inlet and exhaust portions and connecting tube. The drums are separate but connection between them is maintained by a tube which extends about two-thirds of the way into the interior of each cylinder. Above this piping are placed the inlet and exhaust tubes. The gases enter through the latter and expanding, pass through the larger tube into the second drum where the operation is repeated before the burnt products escape into the open air.

Anthony Mowing Machine.

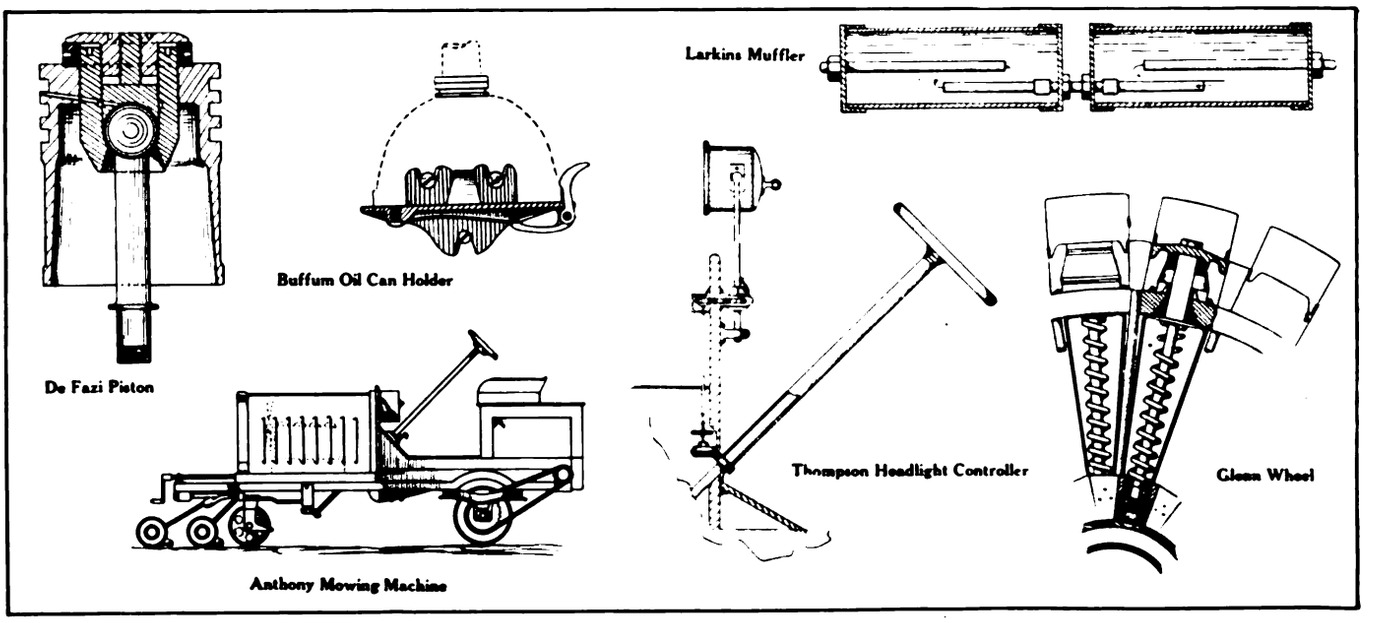
Wendell P. Anthony, Eddystone, Penn., assignor to William Simpson & Sons, Philadelphia, has patented a mowing machine propelled by an internal combustion motor. It is similar to a motor car with the exception that the forward truck carries the grass cutting mechanism which comprises three independent rotary cutters operated through universal joints. The arrangement of the cutters is such that the middle member cuts a swath between those of the others.

Thompson Headlight Controller.

Various devices have been invented for swivelling lamps of the bonnet type, but a new departure is noted in the invention of Francis E. Thompson, Arlington, Mass., who has been granted a patent for a device controlling the dash type of searchlight. The member is pivotally mounted on a shaft carrying a gear in mesh with another pinion and a second shaft actuated by the steering column. When the steering wheel is rotated, motion is imparted through the gears and shafting to the lamp, the latter turning proportionately and in the same direction as the front wheels.

Glenn Wheel.

A vehicle wheel which the inventor claims has resiliency although of the solid tire type, has been patented by Edward A. Glenn, Chicago. This consists of a series of block-like tread members mounted on a rod and coil spring arrangement. Flanges are provided on the under sides of the tread portions and these are of different diameters and adapted to telescope within each other.



Some of the Latest Inventions Applicable to the Motor Truck Industry, Including Novel Gas Engine Piston, Headlight Controller, Muffler, Mowing Machine, Etc.

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CORRESPONDENCE ON PERTINENT SUBJECTS.

Mr. Swinehart of the Republic Rubber Company Discusses the Question of Guarantee for Truck Tire Equipment from an Entirely New Viewpoint.

ANY discussion relative to the use of tires is of deep concern to all branches of the commercial vehicle industry, and particularly to the owner. The following letter takes up the matter from a somewhat different viewpoint, and the arguments of the writer should prove of interest:

Editor, MOTOR TRUCK.

Sir:

I contend that the guarantees made on motor truck tires at present are exorbitant and unjust. Years ago the user was entitled to a service guarantee for the reason that efficient fastening devices had not been developed. The majority of motor trucks were under-tired, and the spring suspension was poor, with the result that the user had to pay dearly for tire service, but of late tire construction has been improved to a degree that warrants users securing a satisfactory service, providing he purchases from a reputable company, and his driver uses fair judgment in loading and driving.

The three parties vitally interested in truck tire guarantees are the tire manufacturer, the truck manufacturer, and the truck user. I will not take into consideration the truck dealer, as he is really a part of the selling organization of the truck manufacturer, neither will I consider the driver, for the reason that he is under the direct control of the user.



B. C. Swinehart, Sales Manager, Republic Rubber Company.

The seven elements governing the length of tire service are: Material, workmanship, equipment, load, speed, road conditions and the driver, or his method of driving. In assigning to each party interested such of these elements as he may be responsible for, I intend to show that the user is really more responsible for the amount of service that can be obtained from truck tires than either the tire manufacturer or the truck manufacturer.

With regard to material, exhaustive tests of material of different characters have been made during past years, with the result that today tire manufacturers are using compounds which in many cases are much better than those used eight to 10 years ago. Even the prices are lower. This has been accomplished only by continual experimenting and testing of various stocks under the most severe conditions.

The workmanship on truck tires has been greatly improved. The designs of the tire have been changed so as permit their carrying heavier loads. The systems of fastening devices and rim design for proper application of tires have been improved, so that it no longer requires hours to make tire changes, and the tire is held more securely in the rim. All this has been the work of careful experts, who have been devoting years of work toward reducing tire cost a mile.

The truck manufacturer is largely responsible for the equipment, as regards size of tires. In the past I have found many cases where the truck manufacturer turned out trucks which were under-tired. His responsibility in this, however, is limited, owing to the fact that many users when buying trucks specify the size of tires which they consider will best accomplish their work. The truck manufacturer is only partly responsible for the loads carried. In cases where one kind of freight only is to be hauled, he can so design the body as to permit the carrying of a normal load only. However, in cases where mixed freight is hauled, he has little, if any, control over the loads that will be hauled by the user.

He is to blame to a degree, however, for the reason that often in making demonstrations he will carry excessive overloads, in order to assure the customer that he has a good strong truck. In a recent case, which came to my notice, a truck manufacturer hauled seven tons of freight a day for two weeks, upon a three-ton truck, in order to demonstrate to the prospective purchaser that his truck would do the work satisfactorily. You can readily realize the strain which was thrown upon the tires. Often truck manufacturers will publish photographs of a new model of truck carrying 100 per cent. overload, yet in selecting their tire equipment they provide for only a normal load.

The speed at which trucks are operated is controlled to a certain degree by the design of the truck, but the truck manufacturer has little control of this feature after the truck leaves his hands. Excessive speed, under fair conditions, rests more largely with the driver of the truck.

I believe that the consumer, through the agency of his driver, is really responsible for loads carried. Overloading can be accomplished by a misplacing of the load; that is, in cases where heavy castings are hauled, it is not fair to place these at the extreme rear end of the truck, neither is it fair to place them to one side, as this will cause the tires nearest the load to receive undue strains. Just as much care should be exercised by the driver in placing his load properly as he should use in not overloading the truck. Tires are designed to carry a certain load, and the factor of safety in design is very small. When a tire is overloaded it will break down under the load. One of the first indications is the loosening of the tire from the rim. This will often go unnoticed until long after the time when the tire received the abuse.

Speed is one of the most destructive elements entering into tire service, due to the excessive heat generated in the tire by internal friction. A truck tire designed to carry a stated load at 12 miles an hour, will give a much smaller part of the required service, if it is forced to carry the same load at a speed of 20 to 25 miles an hour. Driving a truck at excessive speed has the same evil effect that overloading it has, in the event of striking a raised car track, or other obstruction in the street. The blow which the tire receives is increased far beyond its carrying capacity, and the result is a bruise, or rupture, which in time will develop into a broken tire.

The truck user is really responsible for the road conditions, for the reason that he should instruct his driver to pick out the best route as regards road conditions, even though the distance may be greater. Economical tire service can be obtained even over bad roads, if the driver will use judgment in the speed at which he operates. There is a tendency among drivers to take the shortest route, irrespective of the road conditions, feeling that the tires are guaranteed for a long service. The result is they will drive over streets strewn with broken bottles, old iron, stones, etc., which are certain to cut the tires, eventually resulting in the tires breaking up, or going to pieces. One case which recently came to my attention was that of a large packing company operating several trucks. It permitted its drivers to take a short cut over four railroad tracks which were not planked for crossings, in order to save a detour of one block. They maintained that the tires were guaranteed to cover a given number of miles, and they could not pick their roads as they must make a certain number of trips a day.

In considering the driver, I feel that he is really responsible for 60 per cent. of the tire trouble experienced by truck users. He is directly responsible to the user, and should work for his interests to the extent that he should spare the truck and tires as much as possible. A careful driver can get from three to six months more service from a set of tires than a careless driver, even though both cover the same route, and carry the same loads. Spinning the driving wheels when starting, or sliding them when stopping, does more damage to the tires than 16 to 25 miles of normal service. Driving in car tracks throws all the load on one side of the tire, and in the case of dual tires, one side has to carry all the load, resulting in an excessive overload for that tire. A careless driver can ruin the best set of tires made in 2000 miles, by neglecting the usual instructions for operating.

The guarantees in force today are really interpreted as a guarantee that the tires cannot be destroyed in less than 8000 to 10,000 miles, as the case may be. It is true that tire manufacturers impose certain restrictions as regards overload, speed and driving in car tracks, but they have no means of learning to what extent the tire has been abused. A wornout tire will not indicate, except in the most exaggerated cases, the kind of treatment it has received, with the result that adjustments are demanded and received by the users while the tire manufacturer has no way of protecting himself, unless he goes to the trouble of inspecting the records, if such are kept, of loads carried, distance travelled, and trips that the truck makes. This would prove to be a very expensive plan, even if it were possible. In most cases, proper records of truck service are not kept, and the user simply guesses that he has not had sufficient service. Recently a user claimed that he was not operating his truck more than 20 miles a day. I took the trouble to drive over the route which he made in the morning and finished at about 2 in the afternoon, in order to check the distance. That route alone measured 32.5 miles, and he usually made short trips during the afternoon, so that his tire mileage a day was nearer 40 than 20.

The tire manufacturer is responsible for workmanship and material, and has spent thousands of dollars in developing and improving both the construction and the material used, and

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I am satisfied that all reputable manufacturers are honestly trying to give dollar for dollar in tire service The guarantee, from the maker's standpoint, is simply a wager that the tires will run a stated number of miles. If the driver prefers to have them do less, he promptly sets to work to destroy them in the shortest possible time.

The truck manufacturer maintains that a long guarantee on tires aids him in selling his trucks, as he can figure upon a stated tire cost a mile. This, perhaps, is true, to a certain degree, but as the truck manufacturer assumes no responsibility in connection with tire equipment, I feel he should leave this matter largely to the parties most directly interested—the tire manufacturer and the user. The truck manufacturer is only indirectly responsible for the service that tires will give, for the reason that the matter of loads, speeds and road conditions, are entirely in the hands of the user, through the agency of his driver.

The truck user is responsible for more of the elements conducive to an economical tire service than the tire manufacturer and the truck manufacturer together. He has direct control over loads, speed, roads traversed, and the driver. Upon these four elements depend more than 75 per cent. of the responsibility for the tires not giving the average service. I have seen really poor tires give a fair service, where care was used in driving. On the other hand, tires of the best workmanship and material were ruined in a comparatively short time, due entirely to the negligence displayed in their use. Since the elements surrounding the use of the tires play such an important part in determining the length of service, it would seem only just and fair that the user should assume his share of the responsibility, and not demand that the tire manufacturer assume the responsibilities which should really fall to the user.

Yours very truly,

B. C. SWINEHART,

Sales Manager Motor Truck Department, Republic Rubber Company.

Youngstown, O., April 2.

SHOULD MAKERS GUARANTEE THEIR PRODUCT?

WHILE prospective purchasers of industrial transports naturally are interested in the subject of guarantee, it is possible that they fail to consider the manufacturer's side of the proposition. The accompanying communication gives the opinion of at least one maker on this point:

Editor, MOTOR TRUCK,

Sir:

Today the buyer of a motor truck has every advantage in the way of guarantees. The present extremely high costs of motor truck manufacture are brought about largely by the unreasonable demands made by owners and operators. This, of course, is not applicable to all users, for there have always been some reasonable operators, and many are beginning to realize the advantages to be derived from dealing with the truck manufacturer who is producing a first class truck and who, by good business methods, is making a fair return on his investment and will, therefore, stay in business. They can see how a short-time guarantee by this maker is better than a guarantee of two, five or seven years by less conservative, conscientious and businesslike makers. No first class manufacturer of motor trucks will refuse to replace a defective part, if that part be sent to him for inspection, irrespective of any guarantee he may have placed on it.

The commercial vehicle convention in March after careful consideration of the situation, recommended a 90-day guarantee. This does mean that no maker will replace any defective part which may show up six months after delivery, but was adopted for the protection of the manufacturer against unscrupulous users. The time will come when guarantees will be eliminated as unnecessary. Until then, the manufacturer should insist upon the user paying at least for his education instead of continually standing the brunt of it and paying for it himself.

Experience has shown that one of the great troubles has been to convince the buyer of the type of truck he should purchase. If a study of his business showed conclusively to the manufacturer that the buyer should install two-ton trucks and the buyer absolutely insisted that one-ton trucks were of ample size, the manufacturer rather than lose the business, has sold them, with disastrous results. The blame for all failures was invariably placed upon the manufacturer. The user claimed that the trucks were too light and would not stand the work, when the truth is they were overloaded. Had he installed the heavier model, the user would have had satisfaction from the start.

The manufacturer lays down certain rules of proper care, and specifies carrying capacities and maximum speed limits, which if exceeded will result in withdrawal of the guarantee. No attention is paid to these, but if the manufacturer does not help the user out of trouble he has gotten himself into he threatens to trade his trucks for some other make. To the serious detriment of the truck industry at the present time, too many manufacturers are abetting this sort of thing.

Some of the highest costs of truck manufacture are brought about because the truck maker has not only to provide the finished truck, but must bear all the burden of expense in teaching the operators, often even providing the drivers. He must either become an expert on transportation, or hire one and furnish his services free of cost to the customer, who wants an insurance against any possible loss and asks for all sorts of guarantees which are absurd on their face and which he does not get in any other line of business.

Now, why should not the purchaser, who is to be the great gainer, be willing to pay at least for his education? There is nothing that can be done by horses in merchandise delivery that cannot be done faster and more economically by motor trucks, but as the trucks should be handled and treated in a different way from horses, the motor truck manufacturer should certainly be protected if the purchaser insists on handling the truck his own way. Every truck maker who is giving long-time guarantees is, I am convinced, showing a weakness in his product, because his policy proves that he is selling his machines on promises and not on their quality.

Speed governors should be installed on all trucks. It is important that they should be accurate and really govern, holding the number of revolutions of the motor down to a certain given point. However, the governor will not control a truck coasting down long grades and it can often be tampered with by experts without the knowledge of the manufacturer. To overcome this, every truck should be equipped with a speedometer that has a maximum hand or a recorder, which should be sealed or locked and the key kept by the owner. This will show the highest speed attained at any time with the truck. If a fine were charged against the driver for exceeding a certain speed limit, and dismissal were to follow the second fine, 90 per cent. of the present truck troubles would disappear. The song that was written several years ago entitled, "It is not the miles we travel but the pace that kills," should be applied to motor trucks and sung all over the land.

Last of all, tire manufacturers should take an absolute stand against overloading and report every case that comes to their attention to the owner of the truck and to the manufacturer. Above all, they should insist on the use of tires of sufficient size for the load capacity, which they can back up with their guarantees, but they should be perfectly impartial to all truck manufacturers and not give one an advantage over others, which, at the present time, they are doing in many cases.

Every assistance should be given the National Association of Automobile Manufacturers that is devoting so much time to the motor truck industry in an effort to establish a perfectly equitable basis on which to do business.

Yours very truly,

B. A. GRAMM,

Vice President, Gramm Motor Truck Company.

Lima, O., April 4.

MILLER'S NEW CATALOGUE.

The 22nd annual catalogue of Chas. E. Miller, 97-103 Reade street, New York City, is ready for distribution to such as make application for it. It is a neat and attractive volume, comprising 256 pages of information concerning all of the latest and most approved equipment and supplies for motor cars, motor boats, motorcycles and motor planes. Owners and users of commercial vehicles will find this a decidedly valuable book, particularly as a work of reference when in need of parts or fittings.

As is more or less well known, Chas. E. Miller is the pioneer supplies dealer in the automobile industry. "Try Miller" has become an accepted trade term, as applying when it is impossible to secure the needed accessory elsewhere. As importer, exporter, manufacturer and dealer, this house has gained a world wide reputation, and has 15 branches located in nine states throughout the country.

Inasmuch as the firm was established in 1896, it is not at all strange that the 22nd annual catalogue should prove a veritable index of the accessory and supply business. The owner of a motor truck will be surprised to find listed therein practically every product of note produced in America or abroad. It also will be found that several new things have been added, and the fact that Chas. E. Miller indorses them is sufficient guarantee of their worth.

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BRIEF NEWS OF MANUFACTURER AND THE TRADE

The Kadix Motor Truck Company of 6 Watson avenue, East Orange, N. J., has been incorporated for $100,000.

Green & Swett, Boston, will open a branch house at Manchester, Mass., having taken a lease of the Wonson building on Central street.

The Auto Tractor Company, Augusta, Me., has been incorporated for $100,000. L. J. Coleman is president and treasurer, and R. S. Buzzell, clerk.

The Goodyear Tire & Rubber Company, Akron, O., announces that its branch at Birmingham, Ala., is occupying its new quarters at 420-422 20th street.

The Federal Motor Truck Company, Pittsburg, Penn., has taken the agency for the Mais truck, made by the Mais Motor Truck Company, Indianapolis, Ind.

James H. Paplo, 656 Bergen street, Brooklyn, N. Y., has taken the agency for the Packers truck, made by the Packers Motor Truck Company, Wheeling, W. Va.

The Velie Motor Vehicle Company, Moline, Ill., has appointed Fred E. Bradfield, formerly connected with the Chicago branch, as manager of the branch at Boston.

The Pope Manufacturing Company, Hartford, Conn, is contemplating the erection of a four-story addition to its plant, furnishing 60,000 additional feet of floor space.

The Steinbock Engineering Company, Edgewater, N. J., has been incorporated for $1,000,000. The incorporators named are E. J. Forhan, F. B. Knowlton and J. McLaren.

The Worcester Automobile Parts Company, Worcester, Mass., has been organized and incorporated for $10,000. James N. Heald is president and treasurer; Cyrus A. Cowan is clerk.

Albert Bale, Hinckley, Ill., has been appointed agent of the Velie line and will have territory including DeKalb, Lee, Ogle and Kane counties. He will maintain a service station.

The Punctureless Tire Company of Massachusetts, Boston, has been incorporated for $15,000. The incorporators include William E. Riddell, J. Hiram Smith and Frank H. Jenkins.

The Dennis Motor Company, Toledo, O., has been incorporated for $25,000, the incorporators including H. H. Dennis, G. W. Close, Allen E. Reid, R. S. Woodrow and J. C. Meister.

The Alpha Rim Company, Brooklyn, N. Y., has been incorporated for $100,000 to manufacture motor car rims. The incorporators include C. M. O'Donnell, G. H. Tice and M. P. Bau.

The Automobile Repair & Sales Company, 913 North Broad street, Philadelphia, has taken the agency of the Sandusky line, made by the Sandusky Auto Parts & Motor Truck Company, Toledo, O.

The Union Machine & Gear Company, Boston, has filed notice of incorporation with a capital of $25,000. The directors include William L. Thompson, James O. Horne and George C. Little.

The C. A. Scott Company has been organized at Portland, Me., with $10,000 capital and will deal in trucks and motors of all types. The officers include: President, Hugh Lawson, and treasurer, Charles A. Scott.

Gray & Davis, Boston, Mass., has been incorporated for $1,250,000. The incorporators named include William Gray, Alexander Churchward, David B. Kerr, William B. Moses, D. Henry Elkins and William H. Gray.

The Bessemer Motor Truck Company, Grove City, Penn., has established a Boston branch at 903 Boylston street, which will be in charge of Robert G. Howard, who for many years was identified with the Autocar Company.

Robert Kayser, formerly connected with the Boston branch of the Velie Motor Vehicle Company, Moline, Ill., has accepted a position at the Chicago branch of the company. George D. Anderson, formerly with the Haynes Company, is now with same branch.



Ford Dealers of Grand Rapids, Mich., Who Recently Visited the Ford Motor Company at Detroit, Where the Plant Was Inspected and the Party Was Entertained by the Executives of the Company.

Johnson Martin, manager of the South American division of the General Motors Export Company, is on his way to Buenos Ayres, where he will establish headquarters for the G. M. C. line of gasoline and electric vehicles.

Perkins & Corliss, agent at Gloucester, Mass., for the White line, made by the White Company, Cleveland, O., has placed a White truck with the Presson Express Company of that city. The body and top will be of special design.

The Standard Auto Renting Company, New York City, has filed notice of incorporation. Its capital is $10,000 and the incorporators include David C. Goodman, William Machol and Edwin B. Koenig, the latter of 1190 Madison avenue.

Thompson Bros., San Francisco, Cal., has taken the agency in northern California for the Johnson trucks, made by the Johnson Service Company, Milwaukee, Wis. The new concern plans the erection of a garage and service station.

The Peerless Motor Car Company of New England announces the opening of a branch and service station at 773 Broad street, Providence, R. I., which will be in charge of J. W. Breese, a factory representative

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Section of the Assembly Room of the Lippard-Stewart Motor Car Company, Buffalo, N. Y., Depicting a Fleet of Commercial Vehicles Being Made Ready for the Road.

The Findeisen & Kropf Manufacturing Company, Chicago, has secured the Hall Motor Supplies Company of Toronto, Can., as its Canadian distributor of the Rayfield carburetor, also the R. C. Hull Electric Company, Cleveland, O., to represent it in that terrtiory.

The Postles-Prouse Company, Wilmington, Del., has been organized to take over the business formerly conducted by Col. Postles. The officers are: President, G. P. Postles; vice president and general manager, Shanley D. Prouse; secretary and treasurer, John H. Willit.

The International Motor Company, New York City, maker of the Mack, Saurer and Hewitt lines, has opened offices in the Candler building, Atlanta, Ga., making this city headquarters for the Southeast. It is proposed to establish a southern branch and service station in the near future.

The Standard Woven Fabric Company, Worcester, Mass., maker of Multibestos, has increased its selling branches, having closed with Petry-Cassidy, Inc., 1416 Vine street, Philadelphia, as agent in Pennsylvania and the South, also James G. Barclay, 720 Main street, Buffalo, N. Y., who will act as sales agent through central and western New York State.

The Blood Bros. Machine Company, Kalamazoo, Mich., maker of universal joints, is running its plant night and day in order to take care of its increasing business. Several new additions to the factory were made and new machinery installed last summer, but even with the capacity for its output doubled additional structures are expected in the near future.

The Atterbury Motor Car Company, Buffalo, N. Y., has established headquarters for its product at 19 Hoadley place, Hartford, Conn. The company will be known as the Atterbury Motor Truck Company of Connecticut and will have subagencies in New London, New Haven and Waterbury. Edward J. Ives is manager, and R. K. Swett joined the sales force recently.

The New York Lubricating Oil Company's business has grown so rapidly during the last year, especially on the Pacific Coast, that it has been found necessary to open a branch office at Seattle, Wash., at the corner of Virginia and Railroad avenues. A larger warehouse has also been opened in Newark, N. J., the address of which hereafter will be 3739 New Jersey Railroad avenue.

The Lippard-Stewart Motor Car Company, Buffalo, N. Y., announces that the following concerns and individuals are handling its line of commercial vehicles: Sterling Place Garage, Brooklyn; Newark Power Wagon Company, Newark; Ryder Motor Company, Poughkeepsie, N. Y.; W. H. Heinzerling, Sedro-Woolley, Wash.; Turk & Brown, Rochester, N. Y.; Dean DeWitt, Columbus, O.; Neely & Ensor, Baltimore, Md.; Edwin Jennings Company, Bridgeport, Conn.; Michigan Motor Company, Portland, Ore.; The Whitten Motor Vehicle Company, Providence, R. I.

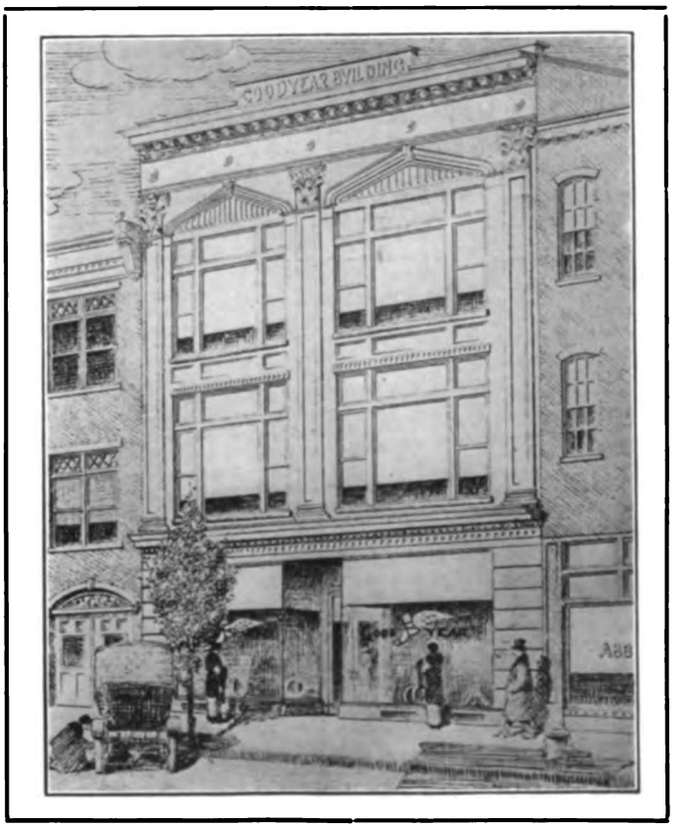
The Ford Motor Company, Detroit, entertained another large delegation of Ford dealers recently and the accompanying illustration presents the party which was photographed after breakfasting at one of the prominent hotels, where the members were guests of the company. An inspection of the plant followed, after which the party lunched at the Log Cabin Inn with the executives of the company. N. A. Hawkins, manager of the commercial department, addressed the agents upon facts pertinent to the mechanical transport, and he also acted as toastmaster at a banquet in the evening. The visitors departed shortly after midnight on a special train for Grand Rapids, Mich.

The Auto-Suburban Company, Ltd., St. Johns, N. B., has filed notice of incorporation. The capital stock is $9990 and the incorporators include J. Fraser Gregory, Clarence B. Allen, John H. Kimball, Harley Knox, Dr. J. Herbert Barton, Dr. Horace C. Wetmore, A. Ernest Everitt, William C. Rothwell, Harold A. Allison, F. J. Likley and William McLaughlin. The company proposes to establish automobile service between Scott's Corners and Millidgeville.

The American Locomotive Company, New York City and Providence, R. I., has appointed the following agents: H. H. Dennis, Toledo, O.; T. A. Crow, Toronto, Canada; Franklin Auto & Supply Company, Milwaukee, Wis.; Park Auto Company, Erie, Penn.; Auto Sales Company, San Francisco, Cal.; Guy R. Champlin, Jacksonville, Fla.; Augustus E. Staley, Decatur, Ill.; William J. Mehring, Harrisburg, Penn.; H. W. Brown, Binghamton, N. Y.; Peden Iron & Steel Company, San Antonio and Houston, Tex.; Levy-Kramer Automobile Company, Dallas, Tex.

The Lippard-Stewart Motor Car Company, Buffalo, N. Y., announces that Charles H. Dahlquist has been secured as assistant chief engineer. He has been engaged with the International Harvester Company for two years as chief engineer of the automobile business. Previous to that he occupied a similar position with the Velie Motor Vehicle Company. He is well known among automobile engineers as a man of unusual ability.

The Goodyear Tire & Rubber Company's Philadelphia branch is now located in new quarters at 207-209 North Broad street and is depicted in an accompanying illustration. The structure is three stories in height and its terra cotta front adds to its attractive appearance. The interior is unusually well lighted. In the arrangement of the basement, special thought has been given to motor truck tires, due to the rapid development of this industry. Spaces are provided for the storage of heavy steel bands, rims and other necessary equipment. The first floor is devoted to the show room, offices, salesrooms, ladies' retiring room, etc. The woodwork is of highly polished oak as are the furnishings The electric lighting system is similar to that utilized in the Chicago branch. In the rear of the salesroom is the adjusting department fully equipped for this work, also a ladies' retiring room for the use of touring customers. The shipping department is at the rear and from it, elevators lead to all floors. On the second floor is located the stock room for pleasure vehicle tires, these being carried in racks of the latest design.



New Home of the Philadelphia Branch of the Goodyear Tire & Rubber Company, Akron, O., Which Is Thoroughly Modern and Contains Every Convenience for Handling Tires, Etc.

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MOTOR LINE TO HANDLE MILK.

The Belt Line Automobile Traction Company, operating between Ninevah, Edinburgh, Shelbyville and Blue Ridge, Ind., held a meeting recently and decided to make stops and pick up cream from farmers living along the route and deliver it to consumers in Shelbyville, the only provision being made was that the business shall warrant the stops. The company was organized last July.

TRANSPORT FUEL BY TRUCKS.

Among the large corporations replacing their horse drawn equipment with motor propelled vehicles is the Standard Oil Company of New York City which maintains a large number of branches throughout the country. The vehicles are employed to haul fuel oil which is carried in special tanks and in the accompanying illustration is depicted a type of truck utilized for this purpose. It will be noted that the chassis is fitted with special sills for the purpose of distributing the weight evenly and that access to the tank is by means of a ladder. When the containers are full the truck is subjected to considerable weight, but the many automobiles in service have demonstrated their ability to haul such loads easily as well as with decided economy over the horse drawn equipment. The machine illustrated is in service at Kansas City, Mo.



Type of Chassis Utilized by the Standard Oil Company for Transporting Oil Fuel at Its Numerous Branches.

TO EXPERIMENT WITH ENGINES.

What is termed a gasoline motor experimental station has been erected at the junction of the Rock Island and Denver & Rio Grande Railroad tracks in Roswell, Col. It is understood that the heaviest stockholder in the enterprise is Richard T. Robinson, Jr., who, with his father, is interested financially in the J. I. Case Threshing Machine Company, Racine, Wis. Edward Rorke is superintendent of the plant.

The recent announcement that the Case concern was about to engage in the production of commercial vehicles and the reported purchase of the Stephenson Motor Car Company, Milwaukee, Wis, by this concern, makes the new experimental station of more or less interest to the industry. The Stephenson company produces a line of mechanical transports, the name of which has been changed to Utility.

EXPRESS COMPANY ADOPTS TRUCKS.

The fact that the leading express companies are replacing the horse drawn equipment with the mechanical transport is attracting the attention of business men throughout the country, who realize that the express concerns have investigated the practical features of the automobile before adopting the more progressive form of transportation. An nouncement is made that the American Express Company has decided to place in service a number of trucks in Portland, Lewiston and Bangor, Me.

LEE TIRES GIVE BIG MILEAGE.

Pneumatic tires are utilized for commercial vehicles of certain carrying capacities and the Auto Car Service Company has been testing for some time past the Lee puncture proof shoe, made by the Lee Tire & Rubber Company, Conshohocken, Penn. Reports from the Philadelphia branch of the Auto Car Service Company show that 29 Lee tires have given a combined service of 153,903 miles, or an average of 5307 miles a tire without a puncture or a blowout.

VELIE TRUCK COST ESTIMATES.

In order that prospective purchasers of commercial vehicles may have a fair estimate of the operating expense of two and three-ton trucks, Morton H. Luce, manager of the Chicago branch of the Velie Motor Vehicle Company, Moline, Ill., has compiled a schedule of estimates. In these the machine is charged off at the end of seven years, and a very liberal allowance is made for upkeep as well as depreciation.

A. D. Frost has been appointed manager of the newly established Alco branch in New York City, and will have charge of the service building on Jackson avenue, Long Island City, N. Y. F. A. Crooks is assistant manager.

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ADAMS TRUCK HAULS EXPLOSIVES.

Mechanical transports are utilized in many industries, but what is believed to be a new use for the automobile is that of hauling dangerous explosives in large quantities. The Independent Torpedo Company transports large quantities of nitro-glycerine from one state to another and until recently horses were employed in this dangerous work. These have now been replaced by an Adams truck, made by the Adams Bros. Company, Findlay, O., and in the accompanying illustration is presented the vehicle carrying 720 quarts of the highly explosive fluid.

The chassis is a regular stock production, the only extra equipment being Swinehart cellular non-skid tires. The regular body is lined with a pan, in which rests a special body having a number of compartments for holding the cans containing the explosive. This inner or special body is also equipped with a pan, which guards against the possibility of any of the fluid leaking into the mechanism of the machine should a can develop a leak.

DOELGER SELLS LAST HORSES.

Peter Doelger, the New York brewer, recently advertised for sale the last horses in his stables, and within 30 days the entire delivery service of the brewery will be by motor, electric trucks of the General Vehicle make being used mostly. When Mr. Doelger purchased his first motor truck three years ago, he was operating 70 horse trucks, and had 175 horses in his stables. He gradually disposed of the animals and substituted mechanical transports, his first experimental purchase proving a great success, and with the sale of his last horses he will be the first brewer to trust exclusively to motor trucks for all purposes. For utility work around the brewery yard, the General Vehicle Company of Long Island City, is designing a special wagon.

Mr. Doelger now uses 38 electric trucks, with 16 more ordered, and eight gas trucks, making a total of 62. The two-story garage which was erected last year is to receive three additional stories, giving it a capacity of 96 trucks, indicating that the present fleet of 62 is to be augmented considerably. While the garage will house 26 more trucks than were operated under the horse regime, the space it will occupy is much less, so much so that the demolition of the old horse stables will leave a space equal to 10 city lots for the extension of the brewery.

MOTZ TIRES IN MAIL SERVICE.

A light delivery motor car now makes the rounds of the mail boxes in Washington, D. C., the United States government having decided the success demonstrated in other fields is sufficient to warrant the adoption of the automobile in this work. The car shown in an accompanying illustration covers a distance of 105 miles a day, making 998 stops for the collection of mail. Conservatively estimating the number of horses it can replace at four, it readily can be seen what a big saving the new system means to the government.



Mail Wagon Fitted with Motz Cushion Tires.

Service is expected regardless of roads or weather, and in this respect this little car has proved absolutely dependable. Probably one of the largest factors in delaying the adoption of the light quick delivery car for mail collection was the tire problem. The motor would not stand the shock of hard tires, and the question of pneumatics hinged upon the matter of expense.

In this instance the problem appears to have been solved through the use of the Motz high efficiency cushion tire, made by the Motz Tire & Rubber Company, Akron, O. This is held to be puncture proof and as resilient as a properly inflated pneumatic, the latter quality being due to the double treads, under-cut sides and slantwise bridges that characterize this make. These tires have given exceptionally good service on the mail wagon mentioned, and the maker claims that it is only a question of time when they will be adopted generally for this type of motor driven vehicle.

NEW ORLEANS WANTS TRUCKS.

The Sewerage and Water Board of New Orleans, La., is to have a motor equipment, bids having been asked for furnishing three machines, either two runabouts and one truck, or two trucks and one runabout.



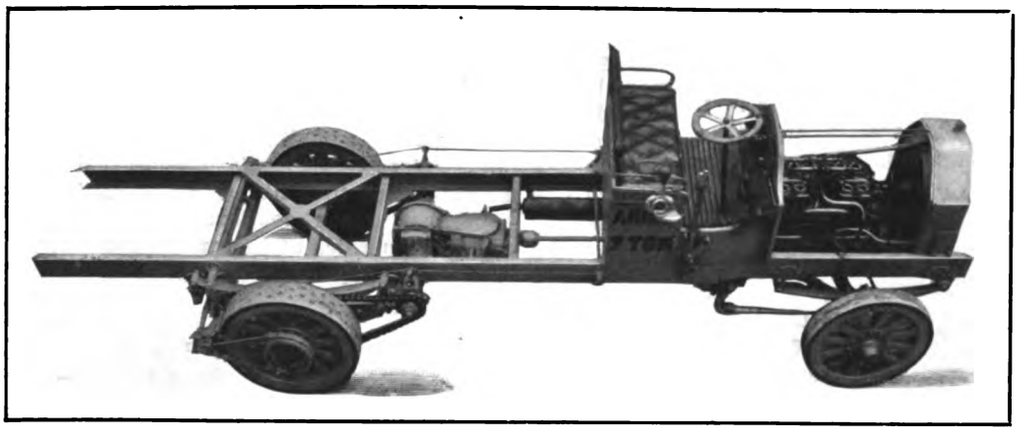
Adams Truck in Service with the Independent Torpedo Company Hauling 720 Quarts of Nitro-Glycerine—The Vehicle Is Fitted with Special Body, Having Compartments for Carrying the Cans.

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CONSTRUCTIONAL FEATURES OF ARIES TRUCK.

THE steel shod truck of France, is the slogan under which the Aries, made by the Aries Manufacturing Company of Villeneuve-la-Garenne, France, is being introduced to the American public by J. Jaccard & Co., 213 West 69th street, New York City. This implies much more than would appear from a casual rendition of the statement. Great emphasis is placed upon the steel tires, but equal force is applied to the statement that this is a truck from France. It is maintained that France is the mother country of the automobile and that it was in that country that the importance of the mechanical transport for heavy duty work was first realized. As a result it is claimed that the problem has been studied with an effort to realize durability and economy. Whether or not America is willing to concede this position, it must be granted that the designers of the Aries vehicle have paid special attention to detail, and as the Aries company has been manufacturing trucks for 16 years, it will prove of interest to examine the workmanship displayed in this seven-ton carrier.

The motor is a four-cylinder, four-cycle, water-cooled unit rated by the maker at 40 horsepower. The bore is five inches and the stroke 5.75. The location is in front under a hood, although this is subject to option, the maker following the Continental practise of placing the engine under the floor when it is so desired. In either case, full accessibility is provided, the mounting being on a special steel sub-frame, bolted against hard wood members which are in turn bolted to the side frame proper, permitting easy removal. In addition, it should be remarked that this form of suspension is designed to present a cushioning effect and completely eliminate all minor vibrations.



Semi-Plan View of Aries Chassis, Indicating Simplicity and Sturdy Construction.

While the subject of metal tires will be taken up later, it is worthy of note that the maker has realized fully the special strains, unusual conditions and excessive vibrations which must be overcome when these are employed, and as it has been engaged in studying this phase of the problem for the past seven years, the result of its experimentation is to be seen throughout the entire construction and assembly. For instance, the motor has been strengthened and stiffened at many points. The entire crankcase is made of steel, carefully designed and admirably proportioned, and despite its strength, it weighs but little more than aluminum castings of the usual construction. The base of the crankcase is carried up to the frame for the motor support, and a staunch cross member makes provision for the rear of the motor and flywheel.

The cylinders are cast in pairs of a special grade of material and arranged vertically. Valves are located on both sides of the cylinder head, being operated from two camshafts through the usual arrangement of valve lifters. Ample provision has been made for the ingress and egress of all gases, and all water, oil and gasoline pipes are large and substantial. Special care has been taken to provide liberal water jackets, which also surround the valve cages, thereby effectually cooling that portion of the cylinder which is subjected to the most severe heat. Small tubing or piping connections have been entirely eliminated and all joints have been given particular attention in order that there shall be no danger of these connections becoming disjointed or broken.

Ignition is by Bosch high-tension magneto, placed on the exhaust side. The carburetor is of special design, fool proof, automatic, and so constructed as to operate successfully with gasoline, benzol, naphtha or alcohol. This is located with the water pump on the inlet side. The lubrication system also is automatic, a pump being employed to force the oil through the crankshaft to all working parts of the motor. A sight feed on the dash informs the operator as to the condition of the supply at all times. The circulating water is kept in motion by means of a gear driven pump. An extra large radiator of the tubular type is mounted forward of the engine, cooling being aided further by a six-bladed fan directly behind this.

The clutch is the dry disc type, employing 39 discs, and alternating with bronze and steel. Adjustment is provided in the nature of a slight movement of a nut on a fine pitch screw. It is claimed by the maker that it requires absolutely no attention and performs its work in a highly satisfactory manner. The transmission is of the selective sliding gear type, affording three forward speeds and reverse. The whole transmission and differential is enclosed in a cast steel case, suspended at three points on the chassis in such manner that no deformation can affect the alignment. The ends of this casing extend to form shelves or bearings for the jackshaft, while the end of the right side is fitted with a projection forming an anchorage for the heavy working brake, the drum of which is in a recess at the side of the portion of the casing occupied by the differential. All gears are of nickel steel.

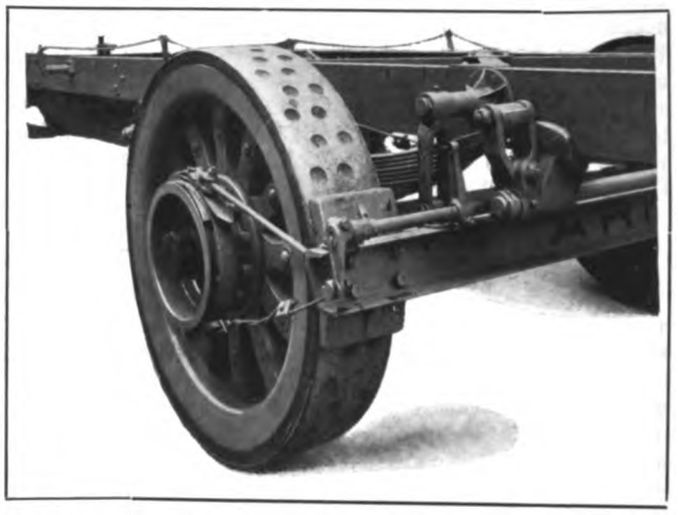
While on the subject of brakes, it may be stated that two sets are provided, one on the differential as explained, and the other acting on the rear wheels. These latter are of the external contracting type. They are so arranged that when the lever is operated, adjustable shoes are applied automatically to the surface of initial tires, as indicated by the accompanying illustration.

The frame is of the Longwy channel steel, strengthened by bars and cross sections. The springs are very long, strong and flexible, with swivel shackles and lubricating bearings. All are semi-elliptic. The forward members are attached firmly to the frame at one end and coupled by a swivel shackle at the other, while the rear members are shackled at both ends. This method of suspension is held by the maker to permit of free up-and-down movement without any warping or twisting of the spring plates themselves. In addition, it is claimed that the steel shod Aries

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rides as easily as any other with rubber tires, by reason of the fact that flexibility of the suspension effectually absorbs all road shocks and much of the vibration.

The wheels are of the artillery wood type, but with the



Steel Tired Rear Wheel and Braking Mechanism on Aries Truck.

hubs supplied with unusually deep flanges, thus considerably increasing the sturdiness of the assembly. The spokes are made of a hard and fibrous wood, air dried by a natural process. Absolutely no kiln dried wood is used. The spokes are cut in conformity with the grain of the wood, so that the grain follows the straight line of the strains in them with accuracy. The whole is bound together by a specially constructed rim or felloe.

This latter is built up of small pieces of French elm, and each section is subjected to a thorough examination before being assembled. It is understood that the wood from which these are constructed is of such close grain, hard fibre and solid structure that it is one of the few woods which will not float in water. It is pointed out that this characteristic should convey some idea of the strength and strain-resisting qualities inherit in it.

The Aries tires, for which so much is claimed, are made of Creuzot steel, which is held to possess the quality of being neither too hard nor too soft, and of being sufficiently tough to withstand constant hammering in service without cracking, and without stretching or expanding. It is held that when these are once placed on a wheel, they need no further attention.

Inasmuch as this particular brand of steel cannot be welded, the tires are cut from a solid billet, which has been brought to a predetermined heat, and a mandrill forced through the centre, thus leaving the billet in the form of a heavy washer. This is next placed in a special machine, and tapering mandrills are driven through the centre, expanding the whole and compressing the fibre of the metal which eventually is to form the tire. This operation is repeated, with heating between each operation, until the billet roughly assumes the shape desired, after which it is placed between two rollers and held under constant pressure. These proceed to roll the tire flatter and flatter, and at the same time still further compress the fibre, driving the molecules into closer relation with each other, until they are ready for the special hydraulic press. This consists of many hydraulic pistons placed radially around the rim of the wheel. These work in perfect unison and subject the rim to pressure uniformly throughout its entire circumference, and knead the steel tire into the wooden felloe. This operation is repeated 14 times, thus tightening the tire on the wheel, and each time with a new setting of the wheel in the machine, until wood and metal form one compact mass.

After the tire is firmly seated, binding the wheel under great pressure, the entire assembly is trued up on a lathe, thus insuring that both wheel and rim are absolutely concentric and perfectly centred. A conical hub is then inserted in the centre of the wheel, also by hydraulic pressure, insuring uniform radial strain on the spokes. This central hub tends to force the spokes outward against the inward pressure of the specially applied rims, and at all times the compression under which the spokes are held maintains the wheel absolutely true, circular, and free from warp or twist.

It is claimed that no Aries tires have ever been worn out in service, although many of them have covered great mileage, in some cases as high as 80,000 miles. The Aries company guarantees them for no less than 100,000 kilometers (60,000 miles). The company is prepared to furnish an extra rim fitted with rubber block tires for winter service, if desired.

MORE ROOM FOR TRACTORS.

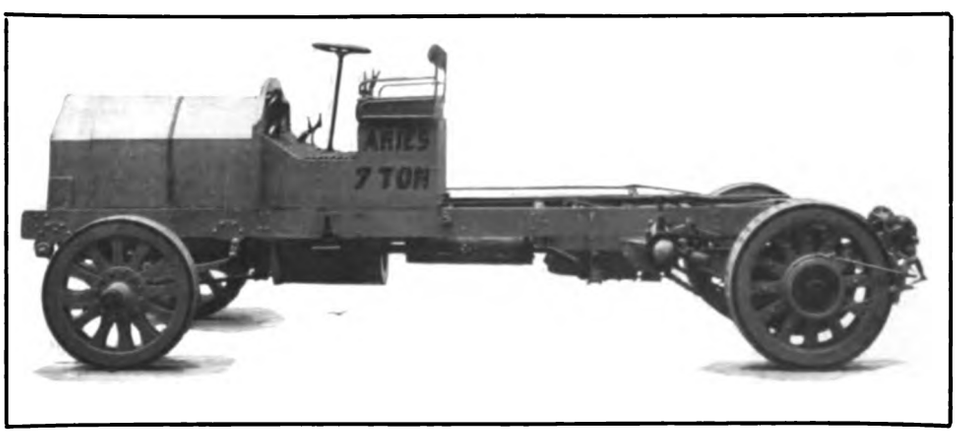
Because of the increasing demand for its gasoline tractors, the Fairbanks Morse Company, Chicago, has decided to enlarge its present factory facilities at Beloit, Wis. The addition will be 80 by 130 feet. A new brass foundry also is being erected.

MOTORS TO COLLECT GARBAGE.

If the plans of the Knox Automobile Company of Springfield, Mass., are carried out, that city, which has had some trouble with its garbage disposal system, will collect garbage by motor trucks instead of by horse carts. A modern incineration plant is to be installed, and the feeling is that with this should go quicker and more modern methods of collection.

TRUCK LINE IN WISCONSIN.

A motor transportation service is to be placed in Sheboygan, Wis., to carry passengers and freight between that city and the towns in the vicinity. Local capital is interested, and the service is expected to solve to a great extent the problem of securing quick and inexpensive transportation facilities. Two 'buses for passengers and two trucks for freight will form the initial equipment of the line.



Side View of Aries Seven-Ton Chassis, Ready for Body Installation.

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MORELAND COMPLETES TEST RUN.

A test run which will prove of more than ordinary interest was undertaken recently by Homer Crouch of the Moreland Motor Truck Company, Los Angeles, Cal., maker of the Moreland distillate truck. The vehicle was of two tons capacity and the run was from Los Angeles to Santa Barbara, a distance of 110 miles, which was accomplished at a cost of 71.5 cents for fuel and oil. Crouch was accompanied by C. H. Smith who acted as observer.

This proved to be the first time that a motor truck of this capacity had been over the road through Casitias pass, and in spite of the bad roads no trouble of any nature was experienced. Conditions were fair from Los Angeles to Calabasas, but soon after that point was reached a sand storm was encountered. The roads in the eastern portion of the pass were badly cut up and this section called for cautious driving. From the pass to Santa Barbara the surface was in excellent condition.

Upon its arrival in Santa Barbara, the machine was turned over to A. C. Grant, the local representative of the Union Oil Company, who had no hesitancy in accepting delivery when he learned how well the truck had performed on this trial trip. Another vehicle of the same make, but utilizing gasoline for fuel, will repeat the test, in order that more comparative cost figures may be obtained.

As has been stated the product of the Moreland Motor Truck Company is designed to use distillate, known as California No. 1, for fuel. This is vaporized in a float feed carburetor. The motor is of the four-cylinder, four-cycle, water-cooled type, with cylinders cast en bloc and arranged vertically. The bore is 4.125 inches and the stroke 5.25, giving a rating under the S. A. E. standard of 27.2 horsepower. Cooling is by centrifugal pump, gear driven, and by flat vertical tube radiator. Ignition is by Bosch magneto and dry cells.

The clutch is a cone member. The transmission is selective, affording three speeds forward and reverse. Final drive is by side chains. Two sets of brakes are fitted, contracting on jackshaft and internal expanding on rear wheels. The frame is of special alloy channel steel, hot riveted and with gusset plates on corners. Springs are semi-elliptic front and rear, with auxiliary springs over the rear axle. Tires are 34 by four-inch single, solid, in front, and 34 by three dual in rear. The wheelbase is either 10 or 12 feet, with tread in front 58 inches and in the rear 64.

BOSTON TRUCK ASSOCIATION.

The Boston Commercial Motor Vehicle Association held its annual meeting recently and elected directors as follows: C. F. Gilmore, agent for Federal and Dayton; A. P. Underhill, Knox; J. S. Hathaway, White; A. T. Fuller, Packard; L. B. Butler, G. M. C.; Day Baker, G. V. Mr. Baker was made treasurer, and Chester I. Campbell, the show promoter, secretary.

NEW G. M. C. CHASSIS.

The General Motors Truck Company, Detroit, has brought out a new underslung G. M. C. chassis, which is expected to allow loading and unloading of heavy materials with ease. This is accomplished by suspending the springs differently than with other models, and by bringing the chassis frame and body lower to the ground. The springs are placed under the axles, thereby gaining space taken by them in the standard construction. In addition to this, the frame is brought still lower, the side members being raised over the axles. This type of chassis will be made in the 3.5 and five-ton capacities.

COLLEGE COURSE IN TRUCK DESIGN.

The Rensselaer Polytechnic Institute of Troy, N. Y., is to establish a course in motor truck design. It will be very thorough in its work and will form a part of the regular mechanical engineering course, being given to students in the senior year. R. L. Streeter, assistant professor of mechanical engineering at the institute who advocated the course and secured its inclusion in the curriculum, will conduct it. Theory and practise will be covered, and the aim will be to enable the students to make a light, economical design which will have the greatest reliability.

SIX ROADSTERS FOR MILWAUKEE.

Milwaukee, Wis., has authorized the purchase of six roadsters at a cost of not more than $1000 each. They will be used by the six assistant chiefs of the fire department. The purchase was recommended by the fire and police committee, and the cars are to be bought in 30 days. It is expected that the department will be furnished with motor apparatus in the near future, though nothing definite has been done in the way of outlining the equipment needed. The fire department operates no motor apparatus at all beyond the chiefs' cars.

MAIL AUTO FOR SYRACUSE.

Syracuse, N. Y., is to have a mail automobile, the local postmaster having been authorized to purchase a car through one of the collectors. In a test made last fall a collector opened 65 mail boxes in 85 minutes, and covered 35 miles. With a horse the same trip took three hours. An allowance of $60 a month is made for maintenance.

RACINE'S CHEMICAL CAR.

Racine, Wis., recently purchased a chemical and hose car for use in the central station. It has a motor of 30 horsepower, and is capable of speeds up to 50 miles an hour. The fire department economized in purchasing the machine by fitting it up with equipment taken from a horse drawn chemical wagon.

'BUS SERVICE IN NEW HAVEN.

New Haven, Conn., which has not been quite satisfied with the automobile 'bus line running out Orange street, is to have a new company which will operate modern vehicles. The concern is being organized with a capital of $60,000, and the plans call for the purchase of six cars. One of the type which is to be bought was tried out on the route recently, and was found to ride much better and have more speed than the ones now in service.

CARS FOR THE CIRCUS PARADE.

The Herbert A. Kline Show, a circus with headquarters in Flint, Mich., is operating two Buicks in its parade. Both contain compressed air calliopes guaranteed to make as much noise as the steam variety with the usual economy that goes with motor operation. The circus is having a Cole car built specially for its use.

PITTSBURG BUYING MACHINES.

The city of Pittsburg, Penn., recently placed orders for six machines, three of which will be used by the police department as patrols, and three by the highways department for handling hot asphalt.

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The MOTOR TRUCK
Devoted to Motor Driven Business Vehicles of All Classes.

VOL. III. PAWTUCKET, R. I., JUNE, 1912 No. 6

BREWERY DELIVERY BY ELECTRIC TRUCKS.

Peter Doelger Eliminates Horses in Metropolitan Plant and Builds Model Garage to House His Vehicles, Reducing Cost More Than 25 Per Cent., Saving Heavy Ground Rental and Permitting Large Expansion.

By William W. Scott.

THE subject of highway transportation is receiving greater and more carefully systematized attention daily, particularly by those who must maintain their own haulage service. It was the demand for better roads that brought about the nation-wide demand for improvement. It is the personal concern through the payment of heavy charges, and the general desire to economize that is impelling study and analysis of conditions, with a view of applying system, because method that will determine cost to the smallest fraction of a cent to a given unit is imperative with all large enterprises of the day. It is this knowledge of expense that is promoting the study of the utility of the mechanical vehicle for all works.

It is not logical to make comparisons of service under different conditions but it is extremely practical to contrast differing service on the basis of cost. Or, to put it another way, to compare the same work accomplished by two methods with regard to economy of time and money. In production or utilization volume must always be considered. New York is the commercial centre of the continent. Its business interests are proportionate to its population so far as community demands are concerned, and its manufacturing and commerce necessitate a volume of haulage that is necessarily larger than in any other community. But the business districts of New York are the older portions of the city, with many of the streets comparatively narrow. These cannot be widened save at great expense. So far as possible they have been relieved from surface railroad traffic congestion, but there is constant increase of vehicular transportation during the business hours of the day.



Electric Trucks of Five Tons Capacity, One Loaded for Delivery and the Other Returning with a Freight of "Empties," at Entrance to Peter Doelger's Brewery, 55th Street, New York City.

Were it possible to equalize the traffic the condition might be greatly relieved, because there are many hours when these thoroughfares are practically deserted. From daylight until early evening the great tide of vehicles surges through the narrow streets, the current in each being alternately stopped and started by the police to permit the crossing at intersecting ways. There is not much delay from the swarms of pedestrians. They have long since learned to make the most of brief cessations of traffic, or have become adept at dodging through mazes of animals, wagons, carts, carriages, motors and surface cars.

It must not be assumed that there is no recognition of conditions or endeavor made to expedite the progress of the vehicles. To the contrary there is a very carefully determined regulation and a large number of police patrolmen on duty to enforce observance of the requirements. Not only this, there is with rare exceptions careful regard for the prescriptions, all of which goes to show that so far as municipal control and supervision is concerned there are decidedly practical results. As a matter of fact it would be difficult to better regulate the traffic unless it were possible to have certain highways for different classifications as to speed that there might be no delays between specified points. So far as type and size of transport, character and proportion of load, and variance of speed may enter into the problem, it may be stated that there is no discrimination and all have equal right and oppor-

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tunity. There are no limitations as to slowness of pace, but the safety of the people demands that there be restrictions as to speed.

These conditions obtain very generally in other large cities of the country, and while there is not the same degree of congestion, perhaps, there is not the same character of supervision, so that there is probably a proportionally larger actual loss from lack of systematic control than in New York. In the communities relatively smaller, especially the older cities, the industries are usually grouped, as are the commercial enterprises, so that there are highways in which the traffic may be very heavy and congested.

As the communities increase in population the business correspondingly develops. The haulage is extended very generally, but with large interests there must be a central location from which delivery may be made, or shipping points to and from which haulage is required. In many instances the requirements of competition impel delivery to the suburbs or to adjacent towns and cities. This is a condition unusually acute in New York. Besides the city itself it is necessary to include in the delivery zone a number of the cities and towns within a radius of roughly 30 miles. This is probably the extreme, although with some of the principal stores and concerns in other lines this may be a very modest estimate. There is, however, a limit to what may be regarded as direct delivery, and some of the firms have established distributing centres to which what is referred to as "transfer" of goods is made, and thence distribution to the customers.

No class of delivery will better serve as an example than that made by the breweries of New York, which is not only constant but exacting, both within and without the city. There are numerous industries of this character in the metropolis and some of them are very large. The breweries are the central points from which distribution is made, and with customers in all directions and sections it is essential that they be given a satisfactory attention. Competition is decidedly keen and to satisfy patrons, all else being equal, there must not only be systematic delivery but an emergency service that will be prompt and reliable.

While the major part of the breweries today employ horses their delivery systems are in a transitory condition, as the animals are being supplanted by trucks driven by mechanical means. This is not meant to imply that these concerns are willing to make sacrifice. To the contrary, practically every brewery stable is a model of its kind and the animals are the best that money can procure, all equipment being of a similar high grade. Neither should it be assumed that there is not a sufficient attention given to the creatures. There is a need of the best service that can be maintained and the requirements are becoming more and more exacting.

Within a comparatively brief period, less than 18 months to be more specific, several of the largest breweries in the metropolis have turned from horses to motor vehicles, and it is only a question of time before practically all the delivery from them will be made without horses. There may be numerous conditions realized by the transition that will be advantageous, but of these none need be considered in this article other than economy, and this despite the fact that with the elimination of horses from haulage in New York it is not too much to say that the efficiency of the trucks would be increased practically 100 per cent.

Of these breweries that which will be considered is that of Peter Doelger, located at 55th and 56th streets, First avenue and Avenue A, which is on a site increasing very rapidly in value, for this is what may now be considered a part of the "downtown" section. This is not the largest brewing establishment in the city but it has long been noted for the quality of its products, the greater part of which was, until within two years, sold practically in New York and vicinage. Today the delivery from this brewery is made entirely by mechanical wagons, and of the 52 in service when the writer visited the garage 42 were electric, and 12 more electrics were to be delivered in groups of four during May, June and July, so that by Aug. 1 it was expected that the total number available would be 54.



Six Five-Ton General Vehicle Electric Trucks at the Loading Platform of the Doelger Brewery in Readiness to Receive the Freights of Kegs and Barrels.

The attention of the writer was directed especially toward the electric installation because of the degree of satisfaction expressed with the vehicles and the service obtained with them. That the horses owned by the firm had been disposed of and entire reliance made upon the motor truck was a sufficient indication of the certain dependability of the service wagons, this having been determined by practical use under every condition—not for months, but for years. All of these electric trucks and wagons are the product of the General Vehicle Company, Long Island City, N. Y., which concern has in service in the metropolis alone more than 1000 machines.

To understand the delivery of this brewery it is necessary to detail some facts relative to its production, its location and its requirements because of probable expansion. As has been stated the brewery is in a section of the city in which property is rapidly increasing in value. It is possible to purchase additional real estate, but this means the investment of more capital, which might be better used in

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Conditions for Storage and Care of the Electric Trucks at the Doelger Brewery Garage, Evidencing the Ideal Manner of Maintenance and Protection.

the manufacturing. Then, logically, with considerable area devoted to stables, these being upon the land adjoining the brewery property, any expansion of the brewery would impel the utilization of the land on which the stables stand and the removable of the barns to the nearest point available.

For years the brewery products were sold in kegs and barrels and distributed to customers about the city. The demand for bottled products was such that it was decided to install a bottling plant, and this was done. The plant is a model and is maintained by the company to be the finest of its kind in the world. It is held to be not only as sanitary as the operating room of a hospital, but in every possible manner labor has been economized. The plant has a capacity of 60,000 bottles a day under normal conditions and this may be largely increased, perhaps doubled, daily. But the demand for these products increased so rapidly that it was decided to later on enlarge the bottling plant, which will probably be done the coming summer or autumn, and this entailed the use of more of the available property.

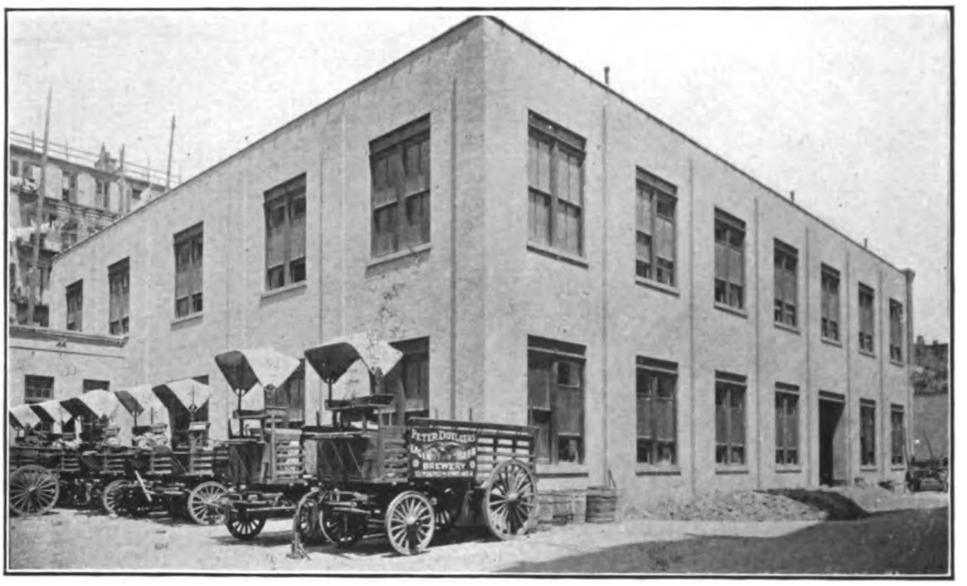
The site of the bottling establishment was originally a stable, and with the decision to erect the building an order was given for electric trucks and wagons to take the place of the horses that were sheltered by it. Whether or not the necessity for the new building compelled the use of trucks or the purchase of additonal real estate and the building of another stable, is not a subject for discussion. The fact remains that the vehicles were ordered and delivered.

The brewery had up to that time owned seven electric wagons, all of five tons capacity. The first of these was purchased in 1903 and it was placed in service that was regarded as extreme. The experience with this vehicle was not uncertain. It was an early type and while extremely useful and dependable it did not and could not receive the attention and care that was desirable to obtain from it the fullest and best results. It was not until six years had elapsed, in 1909, that three more trucks were bought, and when the change was decided on the brewery purchased three others, making a total of seven in use.



Interior of the Model Garage in the Doelger Brewery Yard, Showing the Ground Floor and the Charging Board, Which Will Charge 24 Electrics at One Time.

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Exterior of the Doelger Model Fireproof Garage, with Space for 48 Electric Trucks, Which Is to Be Enlarged to Five Stories to Accommodate 120 Machines, Occupying Part of a Former Wagon Yard.

It will be seen, however, that the extended experience was obtained with the first machine and that it had been owned practically seven years before the next group of three was bought. This trio of trucks had been used something more than a year before the others were purchased. While it is entirely practical to as efficiently maintain a single electric vehicle as a large number, it must be admitted that as the number is increased the cost for each ought to lessen. There are many reasons for this, some of which must be apparent, so it may be stated that the conclusions reached from the experience with these machines were based on approximately a larger expense a vehicle than is now expended for similar service.

The first order for trucks delivered in 1911 was for 16 five-ton machines, and this was supplemented by another for eight 3.5-ton trucks, so that the equipment at the end of the year was 31 vehicles. The first truck had been sheltered in a part of a stable set aside for it, there being no special provision for it. With the addition of the next six purchased no separate building was required, but with the ordering of the 24 bought in 1911 the garaging of the machines became a proposition of large proportions. Meantime 10 gasoline trucks had been bought for a service for which it was believed these vehicles were especially adapted and it was necessary to provide for these as well.

The main brewery buildings had been erected with a court back of them entered through arches from 55th street, this court affording light and a large storage space for wagons. With the use of wagons it was customary to utilize this space constantly. In this court it was decided to build a garage 85 by 100 feet, of two stories. This building was planned to have storage space for 24 trucks to a floor, and allowing all the necessary area for shifting, washing, work on the machines, the elevator shaft, charging installation, and other requirements, it was believed this would be ample.

This building, by the way, is one of the finest structures of the kind in New York. No expense was spared to make it fireproof. There is practically nothing inflammable entering into it. The walls are of brick, the roof is practically indestructible, the lower floor is cement and the second floor is reinforced concrete, supported by large columns protected against fire. The stairs are of iron, and the elevator shaft is enclosed to insure against a spread of flames. The electric installations have been made with extreme care and every precaution has been taken to guard against fire loss and to obtain the lowest rate of insurance. The building was built with a view to future needs and the walls are heavy enough to carry them upward any reasonable number of stories. Nothing has been neglected that will afford the necessary or desirable facilities for caring for and maintaining the trucks. There is a battery department for the repair and maintenance of the batteries, a repair shop adequate for the work that is needed to properly maintain the trucks, and a storage for whatever supplies and parts are not obtainable as occasion may demand.

The garage was believed to be sufficient for immediate requirements and so it was, but the development of the bottling department of the business was remarkable. The products are not sold at retail, but to dealers who retail and deliver them, and there are today no less than 1600 different customers who must be supplied whenever their business demands delivery, some of them receiving deliveries daily. Naturally the weather influences demand and it may be said that there are periods when the consumption is three times as large as at others. This fluctuation cannot be varied and obviously it must be provided for by sufficient delivery facilities to meet any requirement or by additional work by the drivers and trucks.



Section of One of the Two Remaining Doelger Wagon Yards, Where Horse Trucks Are Offered for Sale, Showing the Valuable Area Made Available for Expansion of the Brewery Through the Use of Electric Wagons.

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Front of the Doelger Model Bottling Plant, Showing the Limited Loading and Receiving Space, Where Work is Greatly Economized by the Electric Wagons—The Stables at the Right Are Temporarily Used for Storage and Are Available for Expansion.

The experience during the year of 1911 was so exceedingly satisfactory so far as the electric trucks were concerned that an order for 16 five-ton machines was placed and this was supplemented by an order for 12 more, making a total of 28 for 1912, and of these eight are yet to be delivered. With the sale of five of the trucks built prior to 1911 there are now 46 machines in service and when the deliveries to be made are received the equipment will be increased to 54 electrics. With the capacity of the garage practically reached it has been decided to build three additional stories (the first decision was two), which will increase the capacity to 120 trucks, this being as large a number as will be required for several years at least.

In consideration of this delivery equipment it will be noted that this garage, 85 by 100 feet ground area, will not only shelter 120 trucks, but will include every facility necessary for maintaining them. In contrast with this the one-story brick horse barn that sheltered 135 horses covered an area 100 by 200 feet, and besides this three wagon yards and a blacksmith shop with large ground space were absolutely necessary. It may be pointed out that the wagon yard space was just as valuable as the land on which the brewery buildings themselves stand and the actual rental paid for its use was very large because, aside from its nominal increase, the capital it represented was unproductive. That is to say, the interest on the actual valuation of the land, and the taxes paid, as well as the loss through the withdrawal of the entire amount from the business, must be regarded as the rental of the property.

It will be argued that wagon yards were necessary, that this was a condition peculiar to the conduct of a business of this character and that it would be impossible to obtain similar facilities at a lesser cost. But it will be observed that the business demanded the erection of the bottling establishment, which made the first reduction of stable area. The erection of the garage has provided ample garaging facilities and abundant opportunity for expansion. Not only this, the land on which the stable now stands and two of the wagon yards are now available for building or may be disposed of. Its area is equal to 10 full city building lots, the ground rental of which may be saved. During the visit of the writer in one of the wagon yards and one of the stable sections was piled seven months' supply of coal for the brewery, purchased in anticipation of a shortage and increase of price as a result of the strike of miners and cessation of mining.

Were this property sold there would be the realization of the money it is worth, there would be a saving in taxes, and there will be, with the enlargement of the garage, a much larger opportunity for increased business than existed before the horse equipment was disposed of. Improvements are making to the buildings with a view to having greater storage space, better facilities for loading and unloading, and it is intended to considerably increase its daily production. It will be understood that all of these changes will be practical without purchase of additional land and through the elimination of the animal delivery.

The daily delivery is begun at 3 in the morning at this brewery for many reasons. One is that in the early morning the traffic is lightest and better progress can be made, a matter of importance when it is known that exposure of beer to extremes of heat and cold has a damaging effect. Another is that many routes are long and the hauls are considerable distances. Still another is that the customers can best receive the goods when the patronage is light. The drivers report to the garage and at the time to load it is merely necessary for them to climb on the seats with their helpers and drive from the garage into the street. Here the trucks are lined by pairs in the order of departure and they are backed to the keg department, where two may be loaded simultaneously. Six minutes is the time usually allowed for the loading of a truck with 50 half-barrels, the work being performed by the driver and his helper, they taking the barrels from the loading platform where they are rolled from the store house by other workmen. No matter how quickly the work is done the endless chain of



Interior of the Doelger Bottling Plant, Equipped with the Finest Labor-Saving Apparatus—Use of Electric Wagons in Keeping with the Policy of Economy of Time and Work.

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kegs and barrels is always ready and trucks have been loaded at a rate of 18 an hour without any delay within the store house.

As the loading platform will this year be doubled in length and four trucks may then be loaded at once, it is possible that there will be a considerable saving in time through avoiding some of the delays incident to congestion of traffic—at least with the morning loads. The space for loading at the bottling plant is also limited and here, too, the trucks are lined in pairs and the driver and the helper of each truck packs into it 140 racks of 24 pint bottles each. These trucks are covered and the sides are protected against thieves by heavy wire screens, with rear doors that may be locked when the vehicle is left unattended. The trucks that have the longest routes are sent away first and the others follow as quickly as they can be loaded.

The routes are made to best suit the convenience of delivery. Some may have a few large customers and others many small customers, the loads being made up so that there will be the regular orders with such extra containers as judgment dictates should be allowed. As the delivery is made the filled containers are replaced by the "empties" and when the return is made to the brewery there is usually a load carried so far as bulk is concerned, there being sometimes as many as 90 half-barrels carried.

The weight of a half-barrel filled with beer is about 220 pounds and 50 of these will weigh approximately 11,000 pounds, so it will be seen that this standard load is practically the limitation that judgment would dictate should be carried by a five-ton truck, The 140 racks of bottles is the maximum for a 3.5-ton truck. When horses were utilized a pair drew a truck that carried 50 "halves" but of course the distance travelled was comparatively small. Some of the animals were not driven more than 12 miles a day, perhaps less, and so they lasted for long periods. But it was necessary for the drivers to often use as many as three teams to cover a route, and it may be assumed that, with a walking pace, the delivery was limited. Besides this there was a limit to the hours the drivers worked.

Then with a heavy load and with limited hours and the slow speed of the horses the routes were necessarily shorter than with the use of the trucks. The capacity of the trucks with reference to mileage is 35, half of the distance loaded, and with allowance for delivery, collection of empties, delays in traffic, etc., all of the trucks are back at the brewery at noon, the starts being from 3 to 4:30 in the morning. Very often it is necessary to send out additional loads, for each driver is required to keep his route supplied, and the trucks are available to the limit of their mileage, while it is practical by "boosting" the battery or by shifting the battery to send the same vehicle out for an additional delivery, there being an allowance made the driver for the helper and the extra work performed.

With the very large fluctuation of demand, especially during the heated periods of the year, when the consumption is probably three times what it is during the colder months and the loads are necessarily the maximum, the extra work was very severe for the animals. A first class pair of brewery horses is worth $1200 and the price is increasing constantly. Many die each year because of the hard work and the intense heat, and when the service is most exacting and they are most needed. Not only this, the capacity of the horses shrinks proportionately. It is the same experience during extreme weather of the winter months, so that for a considerable part of the time the animals can be relied upon for from 60 to 75 per cent. of the normal work.

The electric vehicle has the same capacity at all times so far as the brewery service is concerned, save during the period of the year when the streets are obstructed with snow, for then the combined snowfall of the sidewalks and street railway tracks is piled into the roadways until it is removed. The number of days such street obstruction is really serious are comparatively few, however.

It is very evident that with the splendid equipment in the service of this brewery there is a decided saving, to say nothing of other considerations. When the service consisted of 30 trucks and about 50 horses it was stated by the superintendent of the plant, a business man of splendid ability, that there was then a clear profit of $25,000 a year through the use of the trucks. By careful comparison of expense it was determined that the average cost for delivering a barrel of beer was 24.75 cents as against 33.70 cents a barrel with the animals, this being 8.95 cents for each barrel. This is a saving of 26.6 per cent., and it is not improbable that this can be or is now somewhat increased by the better knowledge of the machines and the improved facilities for maintaining them. Not only this, the aggregate economy with the full complement of trucks ordered will be considerably in excess of $50,000 a year, to say nothing of the indirect economies. The total will no doubt exceed $100,000 a year.

Relative to the work of the trucks it is maintained that the drivers as a rule find their own conditions much improved as compared with animal service, for when they report for the day the trucks are ready and waiting for them. When the work is concluded they leave them in the garage and have no further responsibility. The men were required to harness and hitch their own horses, give them attention to protect them while absent from the stables, and on return unhitched them and placed them in their stalls. The stable men gave them the further care necessary. The drivers as a rule are those who have driven horses and know the city and traffic conditions. Delays through accident are seldom and from every point of view the service is at parity with the policy of the management to save labor in every way.

Attention has been directed toward this example because a complete transition has been made in delivery service with a material saving in cost, a more reliable and dependable method, a decided economy of valuable land, and making possible a large expansion that could not have been made without greatly increased expense with the continuance of the use of animals. Of these the last three named, all of importance, cannot be measured in actual figures, but their significance is evident to any business man.

JACKSON BRINGING OUT TRUCK.

The Jackson Automobile Company, Jackson, Mich., is bringing out a new 30 horsepower light delivery car. It will be equipped with solid tires, and it is stated that a special construction gives the results of pneumatic tires without their use.

NEW OLD RELIABLE FACTORY.

Henry Lee Power Company, Chicago, is to increase the manufacture of its Old Reliable truck, and has erected a three-story building in West Ravenwood, Ill., which gives ample facilities for materially enlarging the output.

TO STUDY MOTOR APPARATUS.

The New York State Association of Fire Chief Engineers is to hold its annual convention at Albany. The dates are uncertain, being originally scheduled as June 18-19, and later proposed to be shifted to June 20-21. It is expected that about 150 fire chiefs and commissioners will be present, and that a large exhibit of motor fire apparatus will be shown. All the manufacturers of such apparatus have been invited to exhibit their machines.

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NEW G. M. C. AUTOMATIC DUMPING BODY.

THE growing demand for specially designed dumping bodies has resulted in decided interest in this subject on the part of many manufacturers. One of the latest designs brought to public attention is that produced for G. M. C. 3.5 and five-ton vehicles by the General Motors Truck Company, Detroit, and shown herewith. In this the body is raised or lowered by the power of the motor, the operation being controlled by two hand levers at the driver's seat. That illustrated is adapted to the handling of coal and similar materials, although the same principle is utilized for loading and unloading lumber.

The mechanism consists of an oil tight gearcase bolted to the engine bar cross member, and a separate gear mounted on the clutch shaft. The gears within the case are so arranged that the last, which has a protruding shaft by means of which power is transmitted to the winch, can be brought into mesh with that on the clutch shaft through the intermediary of either two or three gears, depending upon whether it is desired to raise or lower the body.

As applied to the dumping body, the power tumbler shaft connects at its rear end to the shaft of a worm, which, together with its worm wheel, is encased in a cast iron, oil tight housing, suspended from two structural steel angles, placed crosswise of the chassis frame. The worm wheel has a shaft protruding from the housing and carrying a spur pinion which meshes with a spur gear keyed to the winch drum shaft. This latter shaft revolves in two plain bearings bolted to the upper flanges on the side frame members. At its extreme end chain gears act as sprockets engaging the chain that serves to move the raising beam up or down.

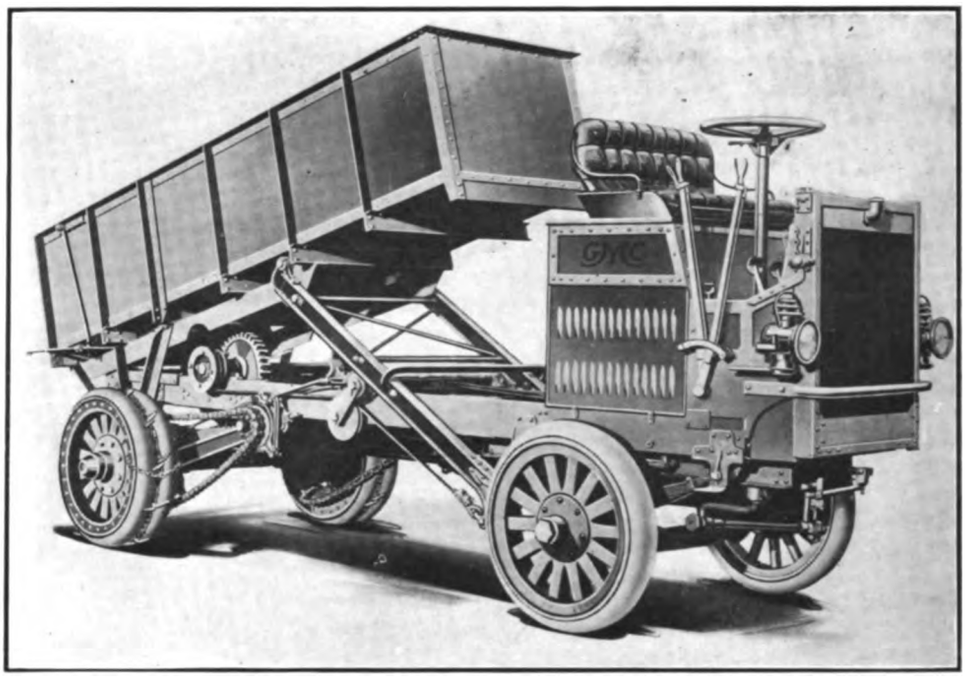
The pitch of worm and worm wheel is such, that in conjunction with a plain thrust bearing used in the worm shaft, the worm and wheel are rendered self-locking. This feature is held to dispense with the necessity for ratchets or brakes on the winch, or mechanisms operated by this worm to hold the load or to prevent it from turning the winch, when the power drive is not actuated by the motor. Thus to secure movement in either direction it always is necessary to impart the proper direction of rotation to the worm, by the motor.

In shifting the gears in the gearbox, the same method of procedure must be observed as when shifting gears in the transmission. The clutch must be disengaged before shifting, and the same thing is true when it is desired to stop or reverse the power. Control of speed of the power drive is accomplished by controlling the speed of the motor, and to some extent by slipping the clutch.

Provision also is made for utilizing the power drive while the truck is in motion, as the gears of the power drive and those of the transmission are not interlocked. This is of particular value when it is desired to spread the material as it is being discharged. This also applies with the device as fitted to lumber bodies, in assisting the load on or off.

In this latter instance the spur gear mentioned as being placed on the worm gear shaft, is replaced by a sprocket on the extension of the worm wheel shaft outside of the chassis frame. This is operated through a roller chain and sprocket on one of the lumber roller shafts. This roller shaft is in turn connected to the rear lumber roller by means of sprockets and roller chain. The loading and unloading is accomplished in the same manner as the raising and lowering of the dumping body—through shifting the gears in the gearbox on the cross member.

It is maintained that it is possible to install this body and its actuating mechanism on any truck, whether originally intended to receive the power drive or not, provided these vehicles have a three point suspension cross member. The only possible exception to this, is held to be a vehicle so built with a wheelbase sufficiently short to bring the universal joints close together and to the cross member, so that there will be no room for the insertion of the gearbox. It is expected that the design will meet with ready acceptance by many purchasers. The fact that it is adaptable for loading and unloading makes it of unusual interest.



New Type of Automatic Dumping Body, Produced by General Motors Truck Company.

MOTORS LOWER FIRE RATES.

Mayor Shank of Indianapolis, Ind., recently celebrated the lowering of the insurance rates by a municipal parade. The reduction will amount to about $100,000 annually, and was made by the insurance companies following the addition to the fire equipment of the city of a number of motor vehicles. Apparatus has been installed as follows: Two squad wagons, ladder truck, combination pump and hose, two combination chemical and hose wagons, and chief's car. Three new fire houses have been built to house the new equipment, and 50 firemen added to the force. The city has been a large purchaser of motors for department use, other branches of the municipal government using machines as follows: Police department, two patrol wagons and touring car; public works, touring car; streets, five runabouts; engineering, two trucks; hospital, two ambulances.

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NEWS OF THE COMMERCIAL VEHICLE INDUSTRY.

Goodrich-Diamond Merger of Decided Importance---Splitdorf Reorganization Also of Interest---Many Truck Companies Organized and Ready for Business.

Official announcement concerning the merger of the Goodrich and Diamond interests, shows that the Diamond Rubber Company, of Akron, O., has been purchased by the B. F. Goodrich Company, of the same city, the amount involved being $45,000,000. Accompanying this consolidation the personnel of the board of directors is to be changed slightly as indicated by the following: Chairman of the board, F. A. Hardy, Chicago; vice chairman, F. A. Mason, Akron; president, B. G. Work; vice president and general manager. A. H. Marks; vice president and works manager, E. C. Shaw; vice president and sales manager, H. E. Raymond; vice president and assistant sales manager, W. B. Miller; secretary, C. B. Raymond; treasurer, W. A. Means; additional members of the board, O. C. Barber and C. C. Goodrich.

The statement issued by the firm of brokers which conducted the negotiations sets forth the details of the transaction as follows:

"Goldman, Sachs & Co., announces for itself and Lehman Bros., New York City, and Kleinwort Sons & Co., London, that arrangements have been completed for the purchase by the B. F. Goodrich Company (New York) and the transfer to it of the property and business of the Diamond Rubber Company. The companies, as is well known, occupy premises in the city of Akron, O., and are two of the half-dozen largest and most successful concerns of the kind in the United States, each manufacturing a great variety of rubber goods, including automobile tires.

"The consideration to be paid by the Goodrich company is to consist of $15,000,000 of the seven per cent. cumulative preferred stock and $30,000,000 of the common stock of the B. F. Goodrich Company. For the purpose of enabling it to carry out the transaction the B. F. Goodrich Company will immediately call a meeting of its stockholders for the purpose of authorizing an increase of its capital stock by the issuance of an additional $15,000,000 of the preferred stock and an additional $30,000,000 of common stock.

"When this increase of stock shall be effected, the capital of the B. F. Goodrich Company will consist of $30,000,000 of seven per cent. cumulative preferred stock and $60,000,000 of common stock. Goldman, Sachs & Co., and Lehman Bros., of New York City, and Kleinwort Sons & Co., of London, have agreed to purchase from the Diamond Rubber Company a large block of the stock of the B. F. Goodrich Company, which, together with the previous purchase of stock made at the time of the organization of the present B. F. Goodrich Company, will comprise about one-half of the entire issue of the preferred stock of the latter company and a considerable amount of the common stock as well.

"It is expected that in consequence of the acquisition of this interest by the banking houses named and the distribution of a portion of their stock among their clients a very much broader market for the securities of the B. F. Goodrich Company will exist in the future than has ever existed for the securities of either the old B. F. Goodrich Company or the Diamond Rubber Company. Stockholders of the Diamond Rubber Company upon the distribution of its assets will receive a considerable amount of cash in addition to their several shares in the stock of the B. F. Goodrich Company preferred and common.

"The Goodrich company will retain the executive staff of the Diamond Rubber Company in addition to its present staff, and it is not expected that any radical change in organization or operating conditions will occur."

MINISTER FORMS TRUCK COMPANY.

The Cleburne Motor Car Manufacturing Company, which was organized recently in Cleburne, Tex., has as its president and leading spirit Rev. H. E. Luck, a local minister. He has been interested in the motor truck field for some time, and two years ago began the construction of a car along original ideas. The parts were made by Mr. Luck and the local machine shops, and the machine was named the Chaparral.

Tested out for a year on the plains from whose principal vegetation the car received its name, it stood up so well that a company was formed to manufacture it. As originally designed the vehicle is expected to cover the average Texas country road and strike across country if need be, through mud and sand. It is to be manufactured in two sizes, one with a 20 horsepower motor, and the other with 25-30 horsepower. Both are shaft driven, the first with planetary transmission and the second with a three speed sliding gear unit with central control.

The organization of the company is as follows: President, H. E. Luck; vice presidents, E. N. Brown and F. L. Deal; secretary, R. H. Crank; directors, J. E. Poindexter, Brown Douglas, G. A. McClung, S. B. Norwood, E. N. Brown, O. L. Bishop, R. E. Gatewood, J. M. Moore, A. C. Barber and F. L. Deal.

STEEL COMPANY PRODUCES TRUCKS.

The Seamless Pressed Steel Company, Redkey, Ind., which has been producing motor trucks in a small way, is considering the possibility of removing to another city and has made a proposition to the Merchants' Association of Hartford City, Ind. A condition which the company makes is that the local business men take stock in the concern to the amount of $25,000, in order that the necessary expansion may be carried out as planned.

CHASE ADDS NEW MODEL.

The Chase Motor Truck Company, Syracuse, N. Y., has added a new model to its already extensive line. This is a delivery wagon rated as 500 pounds capacity with open express body. It is equipped with a two-cylinder, two-cycle, air-cooled motor rated at 12 horsepower, the bore and stroke being 4.125 and four inches, respectively. The design is the same as that of the three-cylinder motor used in the other Chase trucks. Ignition is by fixed spark, provided by a Bosch magneto.

UNIVERSAL MAY REMOVE.

It is stated that the Universal Motor Truck Company, Detroit, is to move to Milwaukee, Wis., by July 1. Although nothing definite has been announced as yet. It is said that certain Milwaukee interests which have considerable money invested in the Universal company have been working to secure the removal of the big plant for some time. The company employs about 2500 men and is capitalized at $1,000,000.

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NEW ORGANIZATION FOR SPLITDORF MAGNETO.

The formation of the Splitdorf Electrical Company with a capital of $3,500,000, to take over the business heretofore conducted by C. F. Splitdorf, Inc., at Walton avenue and 138th street, New York City, is of direct interest to all branches of the automobile industry. It is understood that the reorganization of the company will mean no radical changes in the production of Splitdorf magnetos, spark plugs and coils, and other electrical devices which have been produced by the old concern for a large number of years.

The sponsor for the additional capital available is John F. Alvord, president of the Torrington Company, Torrington, Conn., which with its associated concerns has been engaged in the manufacture of automobile, motorcycle and motor boat parts, accessories and appliances for some time. Mr. Alvord becomes president of the new company and Mr. Splitdorf, vice president.

The name of Splitdorf has been associated with the production of electrical appliances for more than half a century. The Splitdorf magneto has become particularly well known both in America and abroad, and in the face of most strenuous competition has been able to take a place at the head of the list of current producers of this type. The added capital will enable the new concern to bring this product to the attention of the public still more advantageously.

The stock of the Splitdorf Electrical Company is divided into $1,500,000 of seven per cent. cumulative preferred and $2,000,000 of common shares. The officers, other than president and vice president, are: Treasurer, Bryant S. Keefer; secretary and general manager, C. W. Curtiss; directors, the officers and John H. Viles.

PEERLESS COMPANY EXPANDS.

Because of the recent growth of the company's business, the Peerless Motor Car Company, Cleveland, O., maker of Peerless pleasure and commercial cars, recently offered to its stockholders $300,000 of additional capital stock, which was at once largely over-subscribed. It has also sold six per cent. bonds to the amount of $1,100,000, these maturing in installments covering a period of 12 years.

It is understood that the sale of bonds was for the purpose of providing funds for developing and extending the business, particularly in the motor truck department, which has been so successful as to warrant considerable expansion. The additional capital stock provided money with which to take up the company's floating indebtedness.

MEETING OF TRUCK MAKERS.

The second meeting of the Commercial Motor Vehicle Manufacturers will be held June 4 at the headquarters of the National Association of Automobile Manufacturers, New York City. At the meeting in March, the first of the new organization, 50 men were present, and a large majority of the truck makers of the country was represented. It is anticipated that the attendance in June will be even more marked.

The programme which has been given out tentatively is as follows: Standardization of frame widths and lengths, heights of frames and platforms from the ground, proportion of useful load to chassis weight, and tire sizes. Steps also will be taken to secure a census of production. Insurance rates for fire, liability, collision and property damage, and the proposed truck registration bill will receive their share of attention. The freedom of discussion which marked the first meeting is to be fostered, and the invitation urges representatives to come prepared to participate in the discussion with all the information at their command.

TO MAKE ALTER VEHICLES.

The Cincinnati Motors Manufacturing Company, Cincinnati, O., which was recently chartered, has perfected its organization with the election of officers as follows: President, Franklin Alter; vice president and general manager, H. T. Alter; treasurer, J. B. Doan. Franklin Alter is president of the American Tool Works Company, Cincinnati, and is also connected with a number of banks and other industries in the city. Mr. Doan is vice president of the American Tool Works Company, so that the new concern has a good substantial backing. A new plant of large size is to be built this summer, and it is expected that the Alter car will play a large part in the motor truck field. At present, 25 machines are under course of construction.

DRUGGISTS TO INVESTIGATE TRUCKS.

An indication that the National Wholesale Drug Association is taking an active interest in the use of motor trucks is to be seen in the recent action of the secretary of that association, J. E. Toms. He requested that members keep accurate statistics of their costs in using horses and trucks, and place the figures at the disposal of the chairman of the committee on transportation, Charles W. Whittlesey. It is expected that Mr. Whittelsey will present a report on industrial transports at the annual meeting next October, contrasting the efficiency of motor and horse transportation. The figures which the secretary has requested cover the following items: Capacity of trucks and horsepower, average daily run, gasoline a mile, oil a mile, average load, type of tire, tire expense, and comparison of total horse delivery account with motor expense.

HATFIELD TO INCREASE OUTPUT.

The Hatfield Auto Truck Company, which has been manufacturing four trucks a day in Elmira, N. Y., is reported as looking for a new location in order that it may have facilities for materially increasing its output. It is understood that plans are under way for augmenting the available capital, as well.

WARE CARS FOR MINNEAPOLIS.

The Ware Vehicle Company, formerly located in Detroit, where a four-wheel drive motor truck was made, has secured a temporary assembling plant at 771 Raymond avenue, Minneapolis, Minn., and is conducting negotiations with H. J. Tremain of the Minneapolis Commercial Club for the erection of a plant in the twin cities.

NEW OAKLAND COMMERCIAL CAR.

The Oakland Motor Car Company, Pontiac, Mich., maker of Oakland pleasure cars, is to enter the truck field with a 1500-pound, 40 horsepower delivery wagon, which it has just placed on the market. The car has a wheelbase of 123 inches, and has been thoroughly tested out in hard service. Four of the machines have been in daily use for some time at the Oakland plant, practically all the material which is purchased in Detroit being carried on these cars. The distance from Detroit to Pontiac is 26 miles, and this has been covered daily by the trucks, the results being such as to justify further manufacture.

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CONTEST BOARD REVISES TRUCK RULES.

The rules governing motor truck demonstrations which the Manufacturers Contest Association formulated a year ago and which were adopted by the American Automobile Association, have just been revised, according to an announcement by the Contest Board of the latter organization. The changes are not drastic except in one or two instances. In the classification of the trucks a general revision has been made, division 1K now including vehicles of up to 1000 pounds capacity instead of 500 pounds, as before, with the other divisions raised accordingly. The highest section, 12K, now includes machines carrying from 16,001 to 20,000 pounds. The speed regulations have been considerably altered, one of the conspicuous changes being that instead of specifying that the speeds must be adhered to, they are "recommended to the consideration of promoters." The table is as follows:

	—Miles an Hour— Country	Suburban	Congested City
Division 1-K	16	12	10
Division 2-K	16	12	10
Division 3-K	15	12	10
Division 4-K	15	10	9
Division 5-K	13	10	9
Division 6-K	12	10	9
Division 7-K	11	10	9
Division 8-K	10	10	9
Division 9-K	9	9	8
Division 10-K	8	8	8
Division 11-K	6	6	6
Division 12-K	5	5	5

Grade 3 has been eliminated, and there are now but two grades of contest. To take the place of the class which was dropped, the new rules provide that a record of fuel consumption may be kept if desired and the fuel efficiency figures used in determining the standing of the cars. Tire repairs may be made without penalty provided the work is done in six hours, after which time the penalty will be for lateness at controls. A new rule has been added stating that the slower vehicles must give way to the lighter, faster ones on the road.

AUTO PARTS PLANT DOUBLED.

The plant of the Sandusky Auto Parts & Motor Truck Company, Sandusky, O., is practically to be doubled by the building of a new addition and the installation of new machinery. This move is made necessary by the securing of a contract for 2300 motors, to be delivered during the coming year. Plans have been prepared for the new building, which is to be in full operation by next November, and will afford employment for at least 250 men.

BUCKLEN COMPANY GETS FACTORY.

The Bucklen Auto-Truck Company, Elkhart, Ind., has purchased the factory of the Elkhart Wrench Company, in which it will produce Bucklen vehicles in the near future. New and improved machinery is being installed for this purpose.

FARMERS STUDY TRACTORS.

A course of instruction in the construction and operation of automobile farm tractors has been added to the curriculum of the Minnesota State Agricultural College, under the direction of J. L. Mowry, of the chair of engineering. The course is four weeks long; 40 farmers have been enrolled. The mornings are spent in the classroom studying the theory of the practical work which is done in the afternoon, in the shops and on the fields. The shop work includes pipe fitting, valve setting, farm blacksmithing, and experiments with electricity, fuels and oils, while on the field the men get some experience in running gasoline and steam tractors.

AUBURN DELIVERY WAGON.

The Auburn Automobile Company, Auburn, Ind., is to place a new two-cylinder light delivery car on the market. The first cars are under course of construction, and are equipped with a 24 horsepower motor. The carrying capacity is 1500 pounds.

LAMBERT-MORIN ELECTRICS.

The Lambert-Morin Motor Vehicle Company, Lawrence, Mass., after having conducted experiments for the past three years with electric trucks, is now manufacturing machines of its own design for the market. The thorough trial to which the design was subjected insures that the new vehicle possesses strength and reliability for the service for which it is intended.

ARGO TO TRIPLE OUTPUT.

The Argo Electric Vehicle Company, Saginaw, Mich., is building a four-story addition to its factory, which when completed, will enable the company to triple its output of electric trucks. The new structure will be 150 by 150 feet, and is to be ready for occupancy by July 15.

MORE ROOM FOR SAURER.

The International Motor Company, manufacturer in this country of the Saurer truck, which originated abroad, is building extensive additions to its plant in Plainfield, N. J. The main shop, erecting shop, and the store house will each be enlarged. The capacity of the plant will be doubled, and it is anticipated that all of the room will be needed in keeping up with the large demand for Saurers which has been created in this country.

WARNER ENLARGING PLANT.

The T. W. Warner Company, Muncie, Ind., is making extensive additions to its plant, in contemplation of enlarging considerably its line of truck transmissions, steering gears and control levers. The new buildings are of brick and steel contruction.

SPAULDING TO MAKE TRUCKS.

The Spaulding Manufacturing Company, Grinnell, Ia., a large and well established manufacturer of carriages, is to enter the motor truck field with the manufacture of light delivery cars. The concern has had this in mind for some time, and has produced several experimental machines which have been so successful as to warrant placing the construction on the market.

RED SHIELD HUSTLER SOLD.

The Red Shield Hustler Power Car Company, maker of the Red Shield Hustler, a moderately priced light delivery car, has been bought by the Auburn Motor Chassis Company, Auburn, Ind. The new owner has not as yet announced any plans, but it is probable that the manufacture of the car will be transferred from Detroit to Auburn.

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EFFICIENCY IN HANDLING COAL BUSINESS.

Longest Patented Unit Compartment Side--Dumping Body Solves Problem of Delivering Small Loads Economically---Provision Also for Quick Loading.

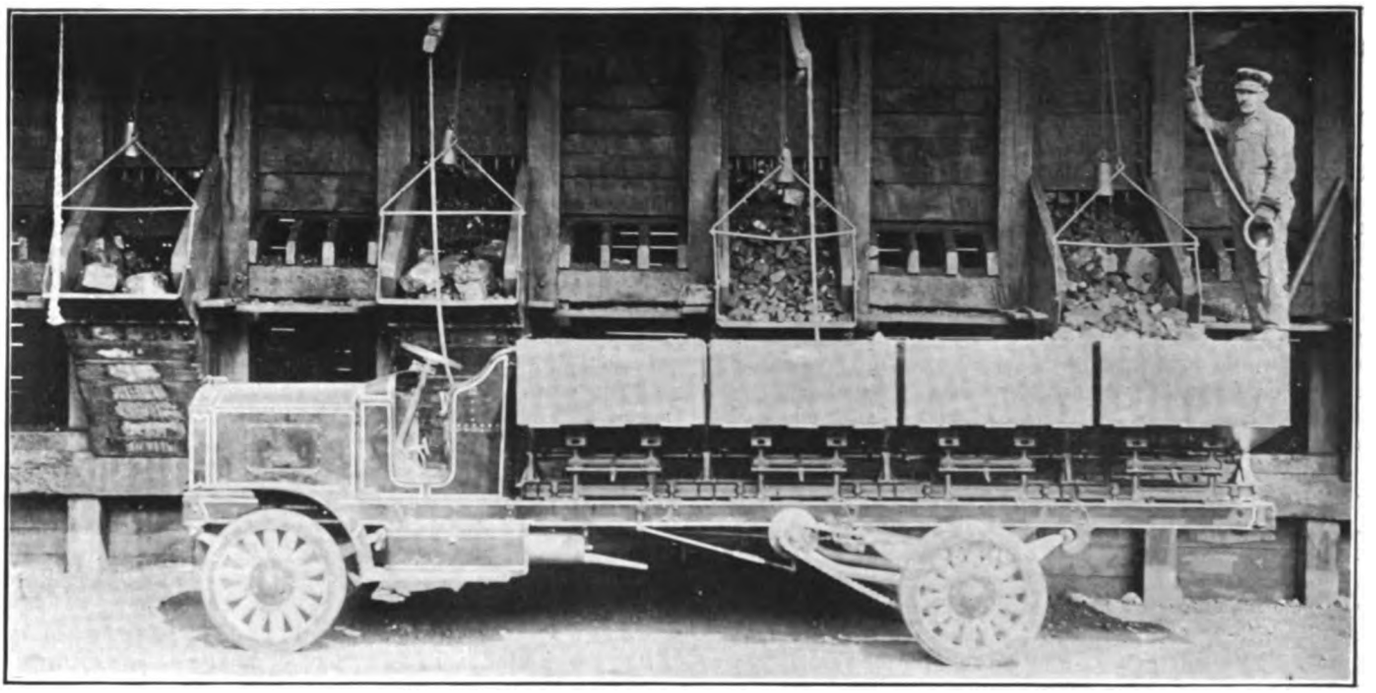
AS THE subject of transportation is being given the careful study that its importance deserves, it is becoming more and more evident that the question of economy hinges largely upon the matter of efficiency. The business world may not be ready to concede to the motor truck industry the credit for bringing these factors to its attention, but it hardly will be denied that previous to the advent of the practical industrial transport little thought was given to the cost of this end of the business. Horses always had been used, and since there appeared to be no other alternative, those responsible for the delivery system paid little attention to details, beyond seeing that the goods were delivered as near as possible to the time promised.

The commercial car salesman who first broached the subject of ton-mile cost found he was talking in terms that were little understood. However, all this has been changed, and today the business man is convinced that motor trucks can do work much more economically than horse drawn equipment. Still, this is not all there is to the problem. Because one firm is able to utilize a certain sized vehicle to advantage is not necessarily any reason that other concerns engaged in the same line will meet with the same experience.

The result has been a careful study of the problem on both sides. The thoughtful salesman who considers the future of the industry does not advocate the purchase of vehicles which he has reason to believe are not adaptable for the work at which they are to be put. In most instances, it undoubtedly will be found that the body equipment is quite as important as that of the chassis. Many manufacturers are realizing this situation, and while it obviously is impossible for any maker of motor trucks to cater to every need in the matter of body design, without reserving a liberal capital allowance for this purpose, there is a growing tendency to specialize in types particularly suited for certain lines.

Considerable attention has been paid to the matter of dumping bodies, designed to meet the requirements of coal, sand and gravel dealers, contractors and others. The subject contains much of interest, and it is one which cannot be dismissed without ample study. The needs are extremely varied. A body which will meet every demand of the large dealer may not be at all suited to the delivery system of others. This applies more particularly to the question of carrying capacity.

Practically all dealers are called upon to carry large loads, at least at times. While economy may be possible with small wagons, the question of efficiency enters into the consideration, and it is not to be assumed that the greatest economy will be present without the maximum efficiency. If a majority of the business calls for small loads, the problem offers one phase, but if the opposite be true, there arises the question as to carrying small loads in a wagon designed for large ones.

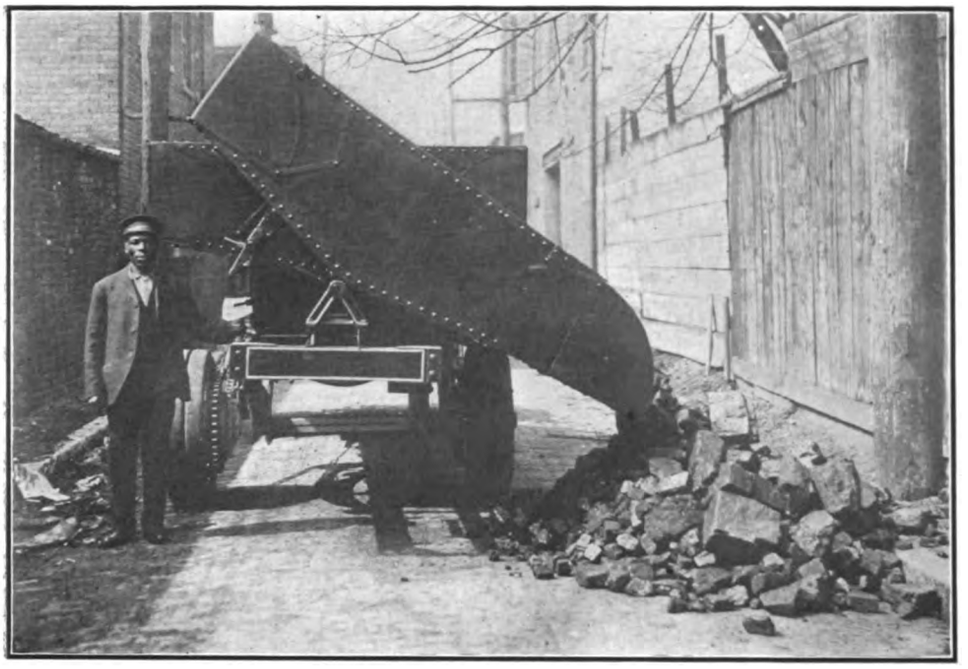


Longest Four-Ton Truck Fitted with Patented Unit Compartment Side-Dumping Body Receiving Its Load of Various Kinds of Coal.

Suppose, for example, that a coal merchant were called upon to deliver four one-ton loads to a certain locality. If he were supplied with one-ton wagons only, this would mean four trips, with approximately half of the time being taken up with what is termed dead mileage. If he were equipped with but one four-ton truck, the situation would be the same, unless some method were devised whereby the four loads could be carried separately and at the same time. There would be this difference, however, in that the cost of maintenance on the larger truck would be greater a vehicle than on the smaller.

To overcome exactly this situation, the Longest Bros. Company, Louisville, Ky., maker of Longest trucks, has produced the unit compartment side dumping body shown

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Rear Compartment Depositing Its Load, Indicating Simplicity of Operating Mechanism.

herewith. This is a patented device, on which the patent was issued Jan. 2, 1912. With this type of body, the merchant referred to above could carry his four one-ton loads at the same time, cutting the cost of delivery very materially, reducing the total of dead mileage in a day, and having available at all times a vehicle capable of handling either large or small loads as occasion should demand.

Of course, this proposition applies in much the same manner to other lines. The building contractor, for instance, would find the Longest body distinctly valuable in carrying two, three, or four different kinds of loads at the same time. The possibilities are many, and the design should find much to commend it.

There are other features of equal merit. It will be noted that the construction of the individual compartments is such that they may be dumped at either side. It may be assumed that the load of coal, for example, is to be delivered in a narrow alley. No turning or backing is necessary; no manoeuvring to get into position. It is immaterial even, which end of the alley the truck enters. The load is dumped just where it is wanted and the driver is free to take the next order to its destination without delay.

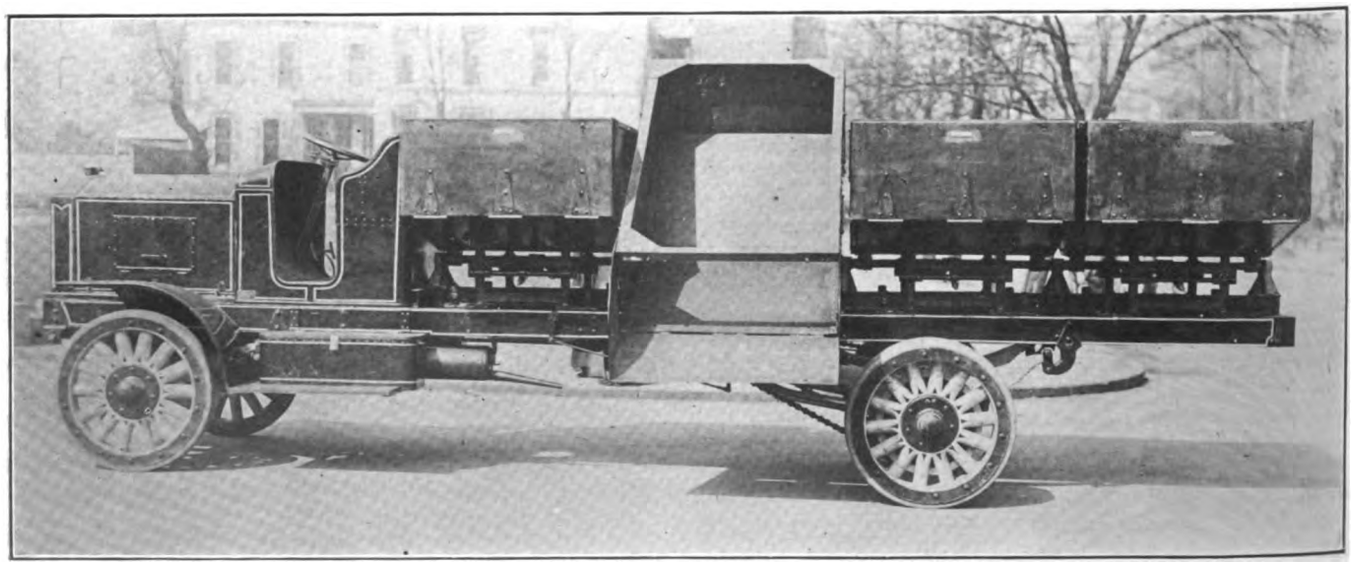
Suppose, however, that the alley is obstructed and the driver cannot get through. As the material is dumped clear of the path over which the wheels must travel, the driver may back out much more quickly and easily than would be possible with a team. The same thing applies to dumping on the sidewalk. In fact, no situation can be cited in which the load cannot be dumped as desired, unless, possibly, that in which the hole is located directly underneath the wagon. Even then, the Longest dumping body could be utilized as advantageously as any other type, except that especially designed for dumping through the bottom.

It may also be pointed out that the contents of the four compartments may be dumped in one place just as easily, and quite as readily. The only manoeuvring necessary would be that of driving the truck forward slightly as each load was dumped and even this may be dispensed with if desired. The very simplicity of the arrangement makes this condition possible, and has an added advantage.

From examination of the accompanying illustrations, it will be seen that each compartment is hinged upon a central rod which is securely braced to the frame. At either side is a pivotally mounted support, a rod extending from the central hinged portion to the centre of this support. This latter rod has a threaded end which passes through the support and carries a nut.

The method of operation is as follows: The nut is screwed back until it releases a clamp which holds the side support in position. This support is hinged, one end folding up against the bottom of the compartment, while the other normally rests in sockets on the frame. As the clamp is released the hinged portion is folded easily, and the upper end is held in place by a catch on the bottom of the container.

After this has been done, all that is necessary is to drop the chute door on this side of the dumper, which as will be noted, is of metal securely riveted. When it is



Depicting Method Employed in Dumping One of the Compartments to the Left, and Showing Inside Construction of the Unit.

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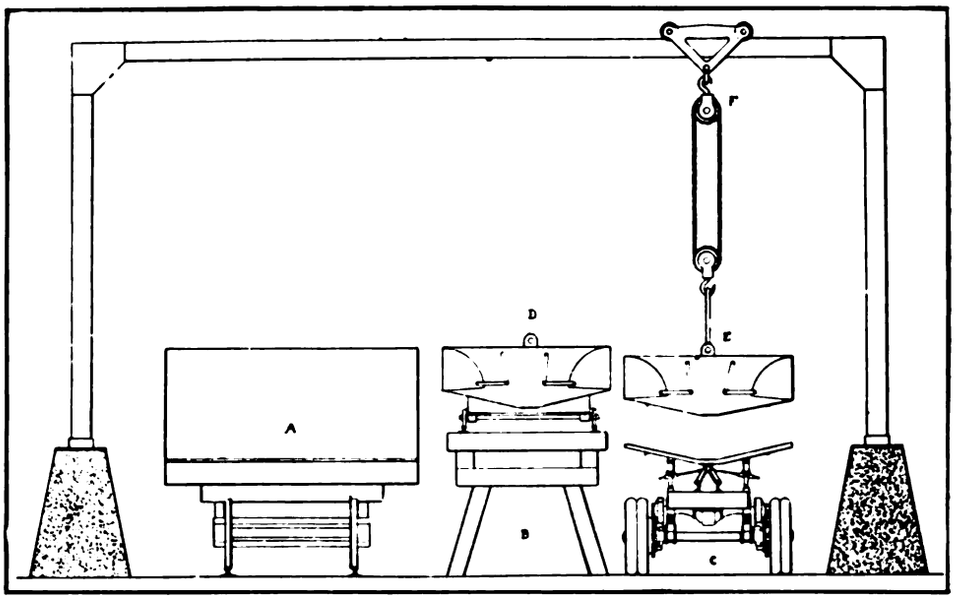
in a normal position the floor of the compartment slopes from either side toward the centre, but as a catch is released on the oppposite side, the support having been removed, the weight of the load tends to tip the compartment and the entire contents are emptied automatically.

The explanation takes decidedly more time in the telling than is required for actually accomplishing the work. As soon as the load is dumped, the body swings back into place, and it is only necessary to restore the supports to their original position, screw up the locking nut, and the truck is ready for the next delivery.

It is maintained by the maker that the use of this dumping body does not necessarily imply that a skilled workman must be employed. There is nothing about the construction that is intricate or not easily understood. It is a plain, simple piece of mechanism, with all parts substantially built, and not liable to breakage, even with extremely rough handling.

The Longest Bros. Company has given the matter of quick loading quite as much attention as that of quick unloading. One of its plans is presented in an accompanying sketch. The arrangement provides for lifting off the empty bins or compartments and replacing with filled ones. This demountable feature can be employed to advantage in many instances, and its practical utility is obvious. It enables the truck to be kept in constant service, save for the very few minutes which are required for exchanging the bodies, and the workmen in the yard or at the coal pockets may be kept busy all of the time in filling bodies. Another advantage is to be noted in the ease with which the exact weight of each load may be determined.

The sketch is self-explanatory. A represents the railroad car or coal pocket. B shows the temporary structure which has been erected to accommodate the compartment. D as it is being filled. C is the truck, upon which a special frame has been installed to take the compartments. E depicts the method of removing the empty body, and F the chain falls so arranged as to travel on an overhead runway. This is suggestive merely, and any similar method might be employed as occasion demanded.



Suggested Method of Quick Loading with the Use of Longest Patented Body.

It ought to be said that these patented compartments were designed primarily for use with the Longest truck chassis, made by this concern. The company produces everything that goes into these vehicles, as well as into the dumping units. All parts are made to jig and templet and are interchangeable. The chassis are designed and constructed with a view to work to which they are to be put.

However, it is possible to secure the Longest dumping compartments for use on other vehicles if desired. In fact, the concern has made a careful study of haulage problems and is prepared to offer a solution to meet any condition. It realizes thoroughly that differing requirements make necessary varying methods of loading and unloading, and is glad of an opportunity to suggest its plan for handling them.

The A. O. Smith Company, Milwaukee, Wis., has established a general sales office for the Smith Milwaukee truck at 2328 Michigan avenue, Chicago.

LARGE FIELD FOR LIGHTER VEHICLES.

It is stated that there are now 412,400 light horse drawn vehicles in four of the eastern states alone, used for delivering the less bulky and heavy merchandise. As the light motor delivery wagon can do the work of these wagons to greater advantage and with superior economy, it is expected that they will supersede the horses to a great extent. What is true of these eastern states is true of all the other states of the country, so that hundreds and thousands of light delivery wagons will be required in the future, as the merchants awaken to their economy and advantages.

In time the motor delivery will be as essential a part of the equipment of a store as is the cash register and the telephone. Department stores are using the light wagon with great success, John Wanamaker operating a number of 1000-pound cars for city delivery of smaller parcels in conjunction with his large trucks. It is in conjunction with the latter that the smaller machines are being used to a great extent by large firms which a few years ago desired heavy duty vehicles or none. They are finding that it costs more to deliver a two-pound parcel by a two-ton truck than it does by a 750-pound wagon, and consequently are using the latter. Loads are taken from the store by the large trucks and distributed among the small machines at various depots in different parts of the city.

Charles F. Redden, manager of the New York Studebaker branch, has estimated that in the next two or three years there will be $200,000,000 invested in light delivery wagons. This seems a large sum, but at $800 each, only 250,000 wagons could be purchased, which would take care of only a little over half of the number of horse wagons in four of the eastern states. Purchases of light delivery wagons are bound to increase in number as the merchant realizes that he is paying from 25 to 30 per cent. more to haul his goods by horse than is necessary.

DURANT-DORT HAS NEW MODEL.

The Durant-Dort Carriage Company, Flint, Mich., maker of the Best wagon of 500 pounds capacity, is bringing out a new 1.5-ton model. This will be provided with a four-cylinder motor, and it is expected will embody some entirely new features.

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THE A B C OF MOTOR TRUCK OPERATION.

A Simple Exposition of the Principles Underlying Operation, Maintenance and Repair of All Motor Driven Commercial Cars, Describing Details of Their Components. Part XIX—Explaining the Function of the Differential.

By C. P. Shattuck.

HAVING outlined the methods utilized for transmitting the energy of the motor to the driving or road wheels, as well as the function of the clutch and transmission, the next logical step is the mechanism by which the power is properly distributed between the driving wheels when the machine is turning corners and describing other curves. This is called the differential although it is also known as the balance, compensating or equalizing gear, and is perhaps, the least understood by the novice to whom it is more or less of a mystery. Few operators understand its principles or can explain why one wheel rotated in a forward direction imparts an opposite movement to the other member when both wheels are not in contact with the ground.

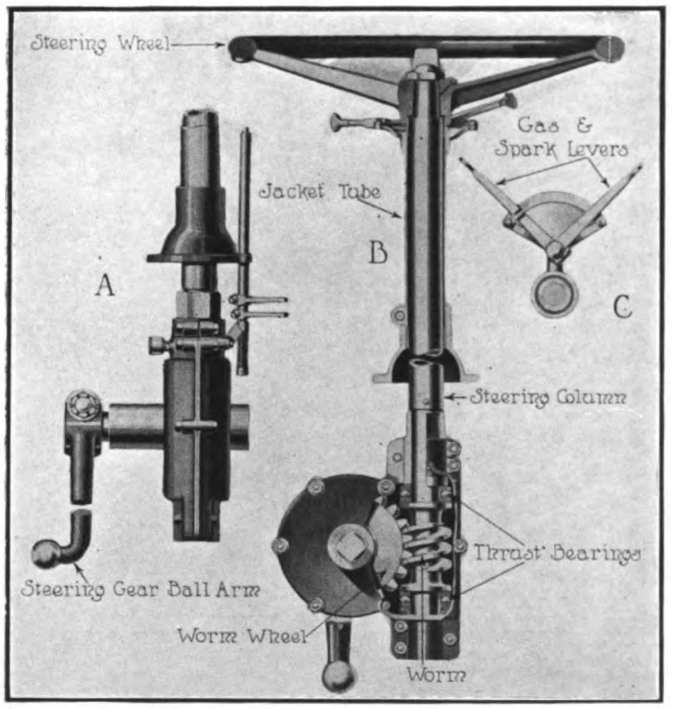


Fig. 80—Components of Steering Gear: A, Lower End of Steering Column and Worm Wheel Housing; B, Outlining Principle of Worm and Worm Wheel; C, Levers Controlling Carburetor and Ignition.

If two wheels of equal size were loosely mounted on a solid shaft as in carriage construction, and moved in a perfectly straight direction, both wheels would rotate at the same speed. If a curve be encountered the outside wheel having a greater distance to travel will rotate faster than the inner member. This will be readily noted by an examination of the tracks of a car on a curve, as at a corner. If the wheels be keyed or rigidly attached to the solid shaft and revolve only when the latter rotates, the inner wheel upon turning a corner would of a necessity be compelled to slide on the ground, and this, of course, would tend to twist the axle shaft as well as subject the wheel to severe stresses.

Theory of "Fifth Wheel."

In a horse drawn equipment the tractive power, the horse, is applied at the front and is separate from the carriage itself. Each road wheel is loosely mounted on a solid shaft and the rear members are rigidly fastened to springs attached to the body. The front axle instead of being bolted to the rest of the frame is secured to a device known as the "fifth wheel" or circle, this comprising two movable horizontal members, one of which is connected to a part of the body and the other to the axle. These circular members are pivotally bolted at the centre, the arrangement permitting the vehicle to turn corners and describe other curves. Were it practicable to apply the motive power to forward wheels mounted in this manner, this plan of construction could be utilized for mechanically propelled road vehicles.

With certain exceptions, however, the power of the motor car is applied to the rear wheels either by chains or shafts, as previously explained, and the movement of the car directed through a steering mechanism actuating the front wheels which are pivotally mounted.

Function of Balance Gears.

Pioneers in the automobile industry adopted balance gears, incorporating them between the divided rear axle. These were of the bevel or mitre type, a design utilized with steam road wagons as early as 1843. These permitted the application of power to the rear axle so that the energy could be distributed properly to both traction members when the vehicle was moving in a straight line as well as when turning corners or describing curves. The device consisted of a bevel gear wheel rigidly attached on either side to the inner ends of the divided axle, one serving to turn the right hand wheel and the other the left. Between these gears were fitted small bevel pinions rotatably mounted upon bearings or studs attached to a casing or housing, secured to the periphery of which was the sprocket or spur gear. This same principle is employed today.

These pinions are in mesh with the gears attached to the ends of the axles and it is obvious that if the right hand gear be rotated in a forward direction the pinions will impart an opposite movement to the other larger gear, causing it to revolve backward; that is, when both wheels are not in contact with the ground and the driving pinion is not actuating the driven gear attached to the differential casing.

Operation of Differential.

When power is applied causing the vehicle to move forward, instead of rotating, these pinions remain motionless, acting as a lock or clutch and securing uniform and continuous rotation of both traction wheels. When a movement to turn the vehicle is made, causing the wheels to move at different speeds, these pinions begin to rotate on their own axes, permitting the pivot wheel to slow up or remain stationary, as conditions may require, yet at the same time continue to urge forward the other at indicated speed.

It is obvious therefore that when the resistance offered by the two drive wheels and attached gear is the same as when the car is driven forward, the pinions cannot rotate, and when the resistance is greater on one road wheel than on the other, they will rotate correspondingly, although still moving forward with the wheel offering the least resist-

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UNIVERSITY OF CALIFORNIA

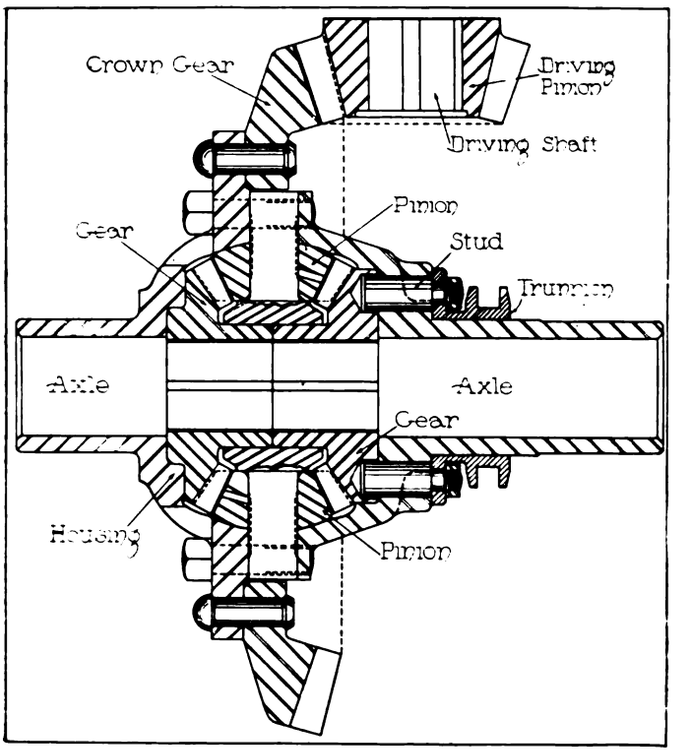


Fig. 81—Differential Gear of Three-Ton Truck with Device for Locking Axles as a Unit.

ance. The pinions may also revolve independently on one gear wheel, while still acting as a clutch on the other and carrying it forward. In other words, the small bevel pinions turn on their studs, allowing the necessary relative motion between the larger gears and at the same time continually transmitting power to the two ends of the axle shaft in proportion to the demand.

Components of Differential.

A conventional type of differential with its components is outlined at Fig. 82, A and B. It will be noted that the differential casing is in two sections and that at A carries the crown gear. It will also be seen that the small bevel pinions are in mesh with a bevel gear to which is attached the end of the axle. Another gear is shown at B and this member meshes with the pinions in a similar manner when the two parts of the casing are secured together by means of bolts. It will be noted that the centre of each larger gear has a square opening into which the ends of the axles fit. A differential assembled is illustrated at C, also the roller bearings supporting the device in the differential housing.

The components of the equalizing gear, axles and driving pinion are grouped at D to show their relation to each other. If the squared ends of the axles were fitted into their respective recesses in the bevel gears and energy imparted to the crown gear through the driving pinion, the sprockets on the outer ends of the countershaft would rotate at equal speed. The road wheels carrying the driven sprockets would revolve at the same ratio as the axles and the differential would revolve as a unit. If the machine describe a curve, the outer wheel will rotate much faster than the inner member and the differential mechanism becomes operative, as previously explained.

Spur Differential.

In the spur differential the bevel gears are replaced by those of the spur type, a large gear of this kind being attached to the ends of the axle. A double set of spur pinions replaces the bevel members, having a bearing in the housing and rotating on axes parallel with the axle. For each bevel pinion there are two spur members which mesh with each other and one is in mesh with one of the larger gears. Although the construction is slightly different the same results are accomplished. A form of spur differential was shown at Fig. 77.

At Fig. 81 is depicted a differential utilized for a two to three-ton capacity truck and the internal parts of this design are made from .20 carbon steel forgings, case hardened and reheated. The bearing surfaces are hardened and ground and oil passages are provided throughout, insuring proper lubrication. Differentials may be equipped with a locking device as indicated, this being simple in construction and serving to prevent the axle rotating except as a unit. It is accomplished by the utilization of eight studs which engage in holes through the back of the side gear and differential casing. These studs are mounted on the outside in a sliding trunnion which is actuated by a lever or similar mechanism when the locking device is desired, to prevent one wheel from spinning.

Chain and Shaft Drive.

When the side chain drive is utilized the differential is incorporated with the jackshaft assembly, energy being conveyed from sprockets through chains to the road wheels which rotate at the same speed as the sprockets on the countershaft when the vehicle is travelling in a straight line. The ratio does not vary until a curve is encountered when the inner and outer road wheels revolve at different speeds because the driven sprockets on the countershaft are not rotating at the same speed because of the differential mechanism. With the shaft drive the road wheels are actuated by the axles between which is located the differential. Various types of axles may also be employed, such as live, semi, three-quarter and full floating.

The Steering Gear.

In order to change the direction of motion of a four-wheeled vehicle, either the front or rear wheels must be moved correspondingly out of line with the other pair.

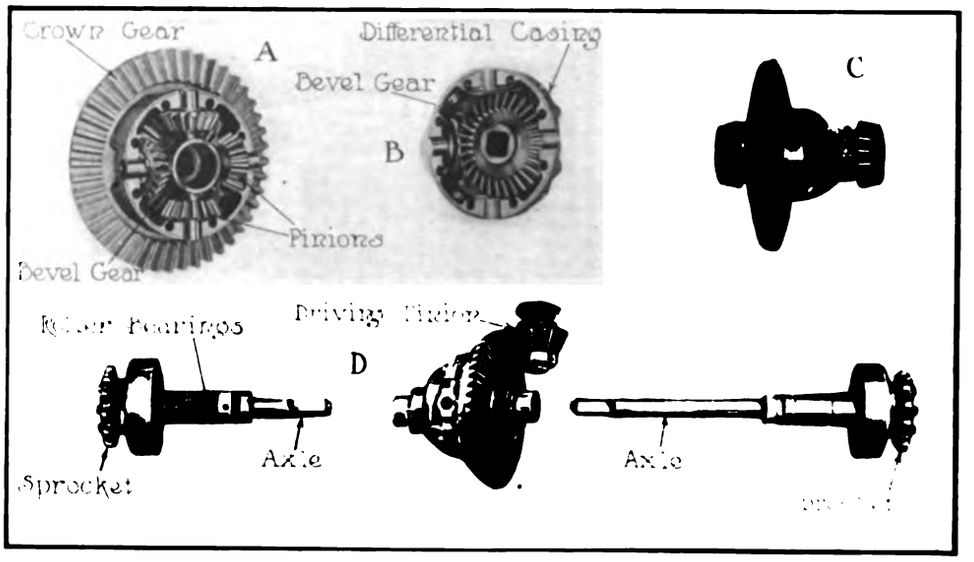


Fig. 82—Construction and Application of Differential Gear: A, Showing Pinions in Mesh with Bevel Gears; B, Casing Removed to Depict Bevel Gear; C, Differential Assembled; D, Outlining Axles, Sprockets, Driving Pinion and Differential and Their Relation to Each Other.

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With the horse drawn equipment this is accomplished by the fifth wheel, but this arrangement is not adaptable to the mechanical transport owing to the room it would occupy and the severe shocks which would be set up to the steering mechanism. Instead a fixed axle is employed with the wheels carried by rotating pivoted axle stubs, which permit of the deflection of each wheel through a relatively wide angle.

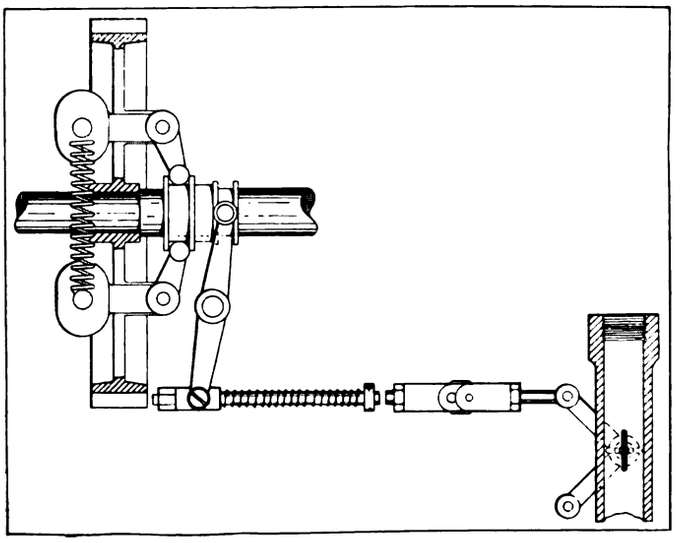


Fig. 83—Governing Device Automatically Controlling Speed of Vehicle.

At Fig. 84, A and B, is depicted a conventional type of I beam section axle utilized for heavy commercial vehicles and it will be noted that the spring pads are integral, these being shown at A. The spindle is secured to the forked end of the solid member by a bolt extending through it which moves freely in a horizontal plane, permitting the road wheels to be deflected into any desired angle. Integral with or secured to each member is an arm, the free ends of which are connected by a tierod which, when actuated by the steering connection, moves each wheel simultaneously. It also serves to align the wheels with the rear members and provision is made for increasing or decreasing the length of the rod to bring about this result.

The spindles are substantially constructed and may be fitted with plain, roller or ball bearings to provide for easy movement as it is important that all components of the steering mechanism operate easily. Roller or ball bearings are employed in the wheels, the hubs of which retain the spokes. The springs are secured to the axle by spring clips and generally are constructed in semi- or full elliptic form. These members are of a high grade steel, carefully tempered. Their width, thickness and number of leaves depend upon the carrying capacity of the vehicle. When semi-elliptic springs are fitted, one end is secured to an extension of the frame while the other extremity is attached to a shackle which in turn is firmly anchored to the frame. Grease cups are fitted to the spring bolts to reduce friction and prevent wear.

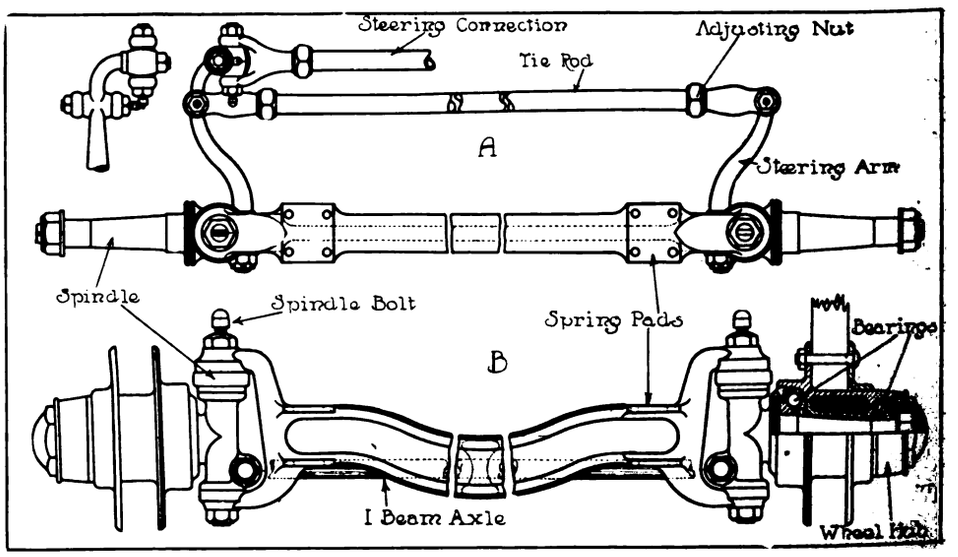


Fig. 84—I Beam Section Front Axle: A, Top View, Depicting Control of Road Wheels: B, Construction of Wheels and Method of Support.

Having provided the car with movable front wheels and a differential for describing curves, it is essential that means be incorporated for directing the movement of the machine without undue exertion upon the part of the operator. It is also necessary that any deflections of the road wheels through encountering obstructions shall not react upon the hand wheel and communicate shocks to the driver's hands. The commercial vehicle is operated over cobble stones, rutty roads, etc., and it is important that components of the steering system be well designed as well as constructed of high grade material.

To prevent the wheels from turning when soft dirt or ruts are encountered the operating mechanism is of the irreversible type. Its principle may be compared to a thread rotated within a nut which is prevented from turning, but capable of sliding. The screw will move the nut easily, but ordinary force applied to push the nut will not turn the screw.

At Fig. 80 B is depicted a conventional type of steering gear adaptable for a heavy truck. It will be noted that the steering column carries a worm which is in mesh with a worm wheel to which is attached an arm having a ball member. The column is free to rotate in either direction, but end motion is prevented by the two ball thrust bearings. When the hand wheel secured to the column is rotated, the worm revolves, imparting motion to the worm wheel which moves the arm backward or forward. The latter is connected with the operating mechanism of the front wheels by a rod. By moving the hand wheel to the right or left the road wheels are deflected in a corresponding direction. The number of turns required of the hand wheel depends to a certain extent upon the pitch of the worm. If this be rather fine several revolutions will be necessary to bring about the desired result.

The worm members are enclosed in a dust and oil proof housing which is secured to the frame of the vehicle. The steering column revolves freely within a tube which is fastened either to the dash or floor of the car. These members may be inclined or in an upright position, depending upon the design of the automobile and to permit of easy steering the hand wheel is of liberal size.

The levers controlling the mixture and spark may be mounted on the top of the steering wheel and rotate with it or located beneath, as shown at B. These levers are depicted at C, one being utilized to actuate the ignition devices, and the other the throttle of the carburetor. The method of establishing communication between the wheel and these members is shown at A. On movable tubes or

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rods are attached two arms to which are secured the rods from the magneto, timer and carburetor. Ball and socket joints or other suitable pivotal devices are employed to facilitate operation.

Governors.

To regulate the speed of the automobile a governor is fitted. This device prevents the operator from exceeding a predetermined rate, as by it the amount of mixture supplied to the cylinders is automatically regulated. The most common form is the centrifugal type, consisting of a pair of weights carried upon and set into rotation by the engine shaft. These weights are drawn together toward the axis of their shaft by means of a spring, so that when the motor is stopped they are close together.

When the revolutions of the engine increase these weights are rotated rapidly and centrifugal force tends to force them apart and against the tension of the spring. A decrease of speed allows them to move together. Attached to the arms of the weights is a collar which moves freely upon the shaft. This collar actuates a rod which opens or closes a valve in the intake manifold or operates the throttle of the carburetor. A type of centrifugal governor is depicted at Fig. 83. Various designs are utilized upon the commercial vehicle and so constructed that they may be sealed to prevent the operator from increasing the speed of the car beyond a rate determined by the owner or manufacturer.

MACHINE FOR FITCHBURG.

Fitchburg, Mass., is to have another municipal automobile, which will be the seventh to be purchased by the city. It will be of the semi-convertible type, the rear seats being removable for the substitution of a box body for tools, etc. The car will be used by the sewer department, and the body is now being built. It is a slightly used 1912 Buick, and it is expected, according to the figures of A. M. Jackson, the assistant superintendent, who will be the principal user of the machine, to prove cheaper than the horse and carriage which has been employed heretofore.

MAINE VEHICLE CARRIES ACID.

A somewhat perilous trip was made recently by a truck in Maine. Loaded with acid, a 3.5-ton machine went from Portland to Whites Bridge, Sebago Lake and return in 3:05:00. The total distance was 40 miles, and the time was excellent, for the roads were poor and necessitated considerable lessening of speed and great care, on account of the fragile carboys which constituted the load. The acid went through without any of it even being spilled.

ALTOONA TO BUY FIRE WAGON.

It is stated that after having had three different makes of motor trucks demonstrated in four different cities for their benefit, the authorities of Altoona, Penn., are about ready to purchase a motor truck for the fire department which will take the place of some of the horse driven apparatus. The fire committee is to hold a meeting some time in the near future to consider the matter.

The members of the committee visited Johnstown, Penn., which is a hilly city, and inspected the work of the American-LaFrance machines which are used there with great success. They then visited Columbus, O., where the Seagrave car is in operation, and were much pleased with the performance of the air-cooled truck in speed and hill climbing tests. They also went to Pittsburg and Wilkinsburg to see the operation of the Knox machines in those places, and again a good demonstration was given.

The committee being satisfied of the advantages and practicability of the motor truck for fire apparatus, has now only to decide which machine it will select. Bids have been opened, and a contract will be awarded in a short time.

PROVIDENCE WANTS TRUCKS.

The board of aldermen of the city of Providence, R. I., has adopted a resolution urging the substitution of automobiles for horses now used in the various city departments, and the establishment of a municipal garage with complete repairing facilities. The resolution directs the committee on ordinances to inquire into and report as to the advisability of this move, but there is no doubt that the report will be favorable, judging from the present enthusiasm.

The aldermen, before passing the resolution, secured statistics on the costs and advantages of motors for municipal service, and believe that a very large saving would accrue to the city in the course of a year by the use of trucks, and that they would pay for themselves in a short time.

The plan is to select some standard machine and equip the various departments with sufficient cars to provide for all emergencies. A comparative table which the men worked out and which led them to pass the resolution places the cost of a horse at $30 a month, covering a distance of 500 miles, while an automobile runabout is figured at $4.30 a month to operate, a cost of about one cent a mile for the automobile where the horse costs six. These figures, together with the knowledge that horses become sick while machines do not, and that the life of a horse is more delicate than that of the motor, convinced the aldermen of the desirability of the trucks.

That they appreciate that to realize the full advantage of a motor installation the machines must be taken care of by experienced men provided with complete facilities is shown in the recommendation for a municipal garage with full equipment. At present the public works, school and park departments of the city are provided with machines, which have proved satisfactory. The final conclusion of the board was that automobile equipment would quadruple the efficiency of the city departments at one-half the expense.

The board of police commissioners has also gone on record as advocating motors, having recently applied for an appropriation of $8000 for the purchase of two motor patrol wagons to replace the present horse vehicles. This has been referred to the committee on finance, and will probably be granted.

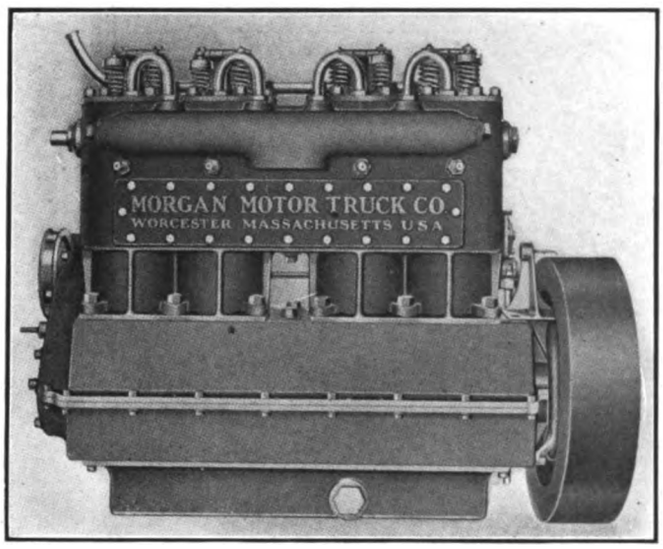
BOSTON SEEKS MORE TIME.

Boston motorists and operators of motor trucks have been waging a campaign lately to be allowed to stand their cars in the streets for a longer time. The regulations in regard to the time cars are allowed to stand at the curb are variable, at the discretion of the local policeman, and consequently matters are quite unsatisfactory for the majority, who do not know just how long they are allowed. The Electric Vehicle Club has suggested that there be a definite time limit for various districts, and that it would be much more satisfactory than a discretionary limit even if the latter were longer. It has suggested a limit of 40 or 60 minutes for the greater part of the city, which would be ample to allow of the usual loading and unloading operation with a motor truck. The street commission is to take the matter up, and doubtless will give all interested in the proposition opportunity to be heard.

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FEATURES OF MORGAN FIVE-TON TRUCK.

RELIABILITY, durability and economy are important factors in the transportation problem and these receive serious consideration by the conservative business man contemplating the replacement of his horse drawn equipment



Exhaust Side of Morgan Motor Utilized in Five-Ton Truck.

with the mechanical transport. Uninterrupted service enters into the question of economy and for a truck to be operated at its maximum efficiency the entire mechanism must be simplified to a minimum so that the most inexperienced driver can understand it. Every working part must be immediately accessible for inspection, adjustment and replacement.

The Morgan trucks, manufactured by the Morgan Motor Truck Company, Worcester, Mass., were designed by Ralph L. Morgan, one of the pioneers in the automobile industry. His engineering experience extends over a period of years and he has made a careful study of the transportation problem both abroad and in this country incorporating in his models the best engineering practise. These automobiles were tried out under the severest conditions and after seven years of careful experimentation the present Morgan truck was placed upon the market.

It was originally designed upon three basic principles, strength, simplicity and accessibility, and during each stage of its development up to its present high efficiency these have been fundamental. To secure the greatest simplicity the chassis was designed upon the unit system, consisting of four complete units, the motor, transmission, jackshaft and differential; frame and springs, and axles and wheels. Any and each of these may be removed easily and quickly without disturbing other components. For example: The power plant may be removed by displacing four bolts and disconnecting the exhaust pipe, or the transmission dismounted without interfering with other working parts. This construction lends itself readily to quick repairs or replacements necessary through accident.

Distribution of Load.

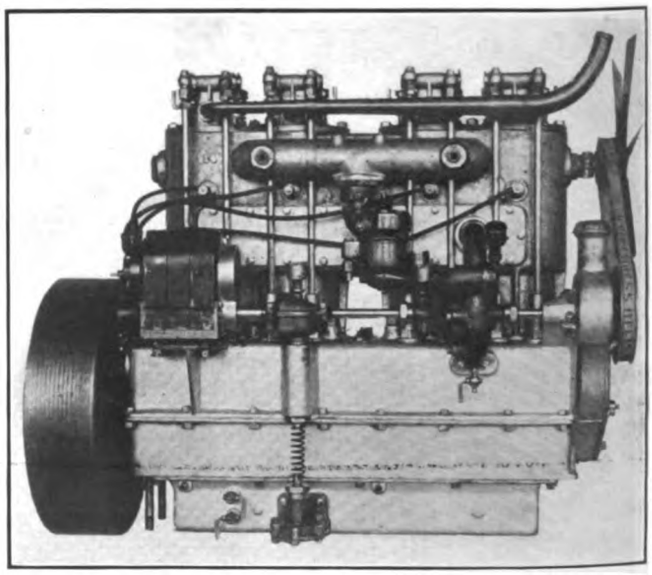
A noteworthy feature of the design is the proper distribution of the load, this being brought about by the utilization of the space usually occupied by the motor in front type for the driver's cab. From the front of the radiator to the rear cross frame member all space serves a useful purpose, permitting of a 143-inch wheelbase without undue extensions in front of the dash. The advantage of such an arrangement is obvious when operating in traffic or turning the machine in narrow spaces. The fact that but 65 per cent. of the load is carried on the rear wheels makes for economy of tires and general upkeep.

The driver is located at the right with the motor in the centre of the cab and all the components of the latter are not only accessible, but are designed strictly for truck service. A vertical four-cylinder, four-cycle, water-cooled unit is employed, having a five-inch bore and five-inch stroke and with S. A. E. rating of 40 horsepower, although it will develop considerably in excess of this. The cylinders are cast en bloc, a special high grade, close grained gray iron being utilized and are ground accurately, as are the pistons and rings, insuring perfect compression and an evenly balanced motor. Integral with the cylinders are vertical webs, these extending from the base of the water jackets which are also cast integral, making for compactness as well as stability.

Removable Cylinder Heads.

One of the features emphasized of the Morgan product is the simplicity and accessibility of the valves and their operating mechanism. Both the intake and exhaust members are located in a removable cylinder head, are of ample size, and constructed of high grade material. By loosening a few nuts these heads may be withdrawn for inspection or for grinding the valves. The latter are of the rocker type and the actuating mechanism is not only simple but of liberal proportions, which with provision for proper lubrication not only insures correct valve timing, but long life of the working parts. The valves are on the right hand side of motor and are mechanically operated, their lifts being of large size and moving in substantial guides. High grade material and workmanship have created a quiet running power plant.

The intake manifold is integral with the cylinders and is of a straight line design facilitating the ingress of the mixture which is supplied by a float feed carburetor on the right hand side of the motor. The vaporizer is of special construction, being designed for the Morgan motor and it is claimed that it is adjusted easily and when once set requires no alteration or attention whatsoever.



Simplicity and Accessibility Are Features of the Morgan Motor Located in the Cab Beside Driver.

The exhaust manifold embodies the same excellent features as the intake, being integral with the cylinders. Each end is fitted with removable plugs through which any carbon may be removed easily. The exhaust pipe is also of

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liberal size and back pressure is reduced to a minimum. The left hand side of the motor is remarkably free as will be noted in an accompanying illustration. The crank and camshaft are of high grade material, carefully ground to size and operate in liberal bearings. The gears are of high grade steel, accurately cut.

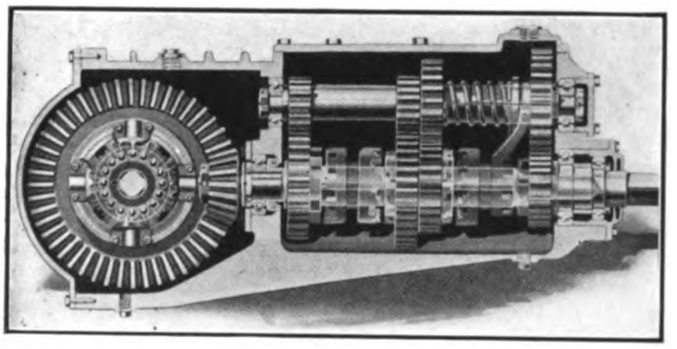
Ample Cooling Surfaces.

In the matter of cooling, the Morgan motor is noteworthy in design, as not only is provision made for maintaining the proper temperature under all conditions, but for cleaning as well. The exhaust side is fitted with a detachable plate as is the intake side, and an opening in the latter allows water from the pump to be forced through the large water jackets, around the valves and thence through a well designed manifold to the radiator. A large sized centrifugal pump, gear driven, takes the cooled water from the radiator which is of high grade cellular type and of ample size.

Dual Ignition.

Two separate and distinct ignition systems are utilized, each having its own plugs. A four-unit vibrating coil, timer and battery furnish the ignition for the plugs on the left of the motor while a high-tension magneto supplies current to the plugs on the right. Either system may be operated independently of each other. The coil is located on the right of the dash in a recess and is accessible as well as being protected from possible injury.

Considerable attention has been paid to detail in the Morgan power plant. The pump is equipped with a petcock



The Transmission Is of the Constant Mesh Gear Type Providing Easy Changes of Speeds Without Clashing of Gears.

by means of which the entire water system may be drained while compression cocks are fitted to the detachable cylinder heads, and grease cups to the bearings of the shaft driving the pump and magneto. An adjustable, ball bearing fan, driven by an endless belt, aids in cooling and its driving pulley is actuated by the same gear as that operating the pump and magneto. These gears are easily accessible by the removal of a housing.

Dual Lubrication System.

The efficiency of an internal combustion motor depends largely upon its lubrication and special attention has been given to this important subject. Two separate and distinct oiling systems are employed. A gear driven pump forces oil through an aperture in the crankshaft to each bearing and to all connecting rod bearings. This lubricant is constantly circulated. Interposed between the crankcase and oil reservoir is a pressed steel pan carrying the lubricant utilized for the splash system. It will be noted that the crankcase is constructed in three sections and being accurately machined is oil tight. The pump is attached to the lower member and is actuated by a spiral spring, relieving it from all possible shocks and making for accessibility. The lower crankcase is equipped with two petcocks for noting the supply of lubricant and for draining the old oil.

The Morgan clutch is of the multiple disc type with al-



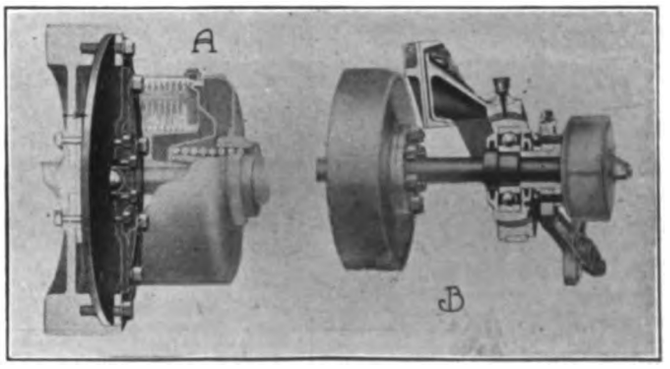
Depicting Accessibility of Components of Driving Ends of Jackshaft, Including Rubber Cushioning Blocks.

ternate plates of steel and copper, these operating in a bath of oil. A feature of the device is a leather universal attachment inserted between the flywheel of the motor and clutch. This disc being of very flexible leather relieves the clutch of all shocks.

The Morgan transmission is of the selective type providing three speeds forward and reverse and the change speed gears are always in mesh, preventing the stripping of teeth as well as obtaining at all times the benefit of the full strength of the working faces of the gears. Clashing of gears is impossible as the transmission has a set of jaw clutches or dogs on the face of each of the speed change gears which are loosely journaled on the driven shaft, and two corresponding double sliding clutches mounted on squared portions of the driven shaft, by which any one of the speed change members may be locked to the shaft. Each set of clutches has an aggregate parallel working face of 2.5 square inches to withstand all stresses in making changes of speeds, which may be accomplished easily regardless of the rate at which they are rotating. It will be noted that the transmission is of the built-up type, the driving shaft being below, making for compactness and accessibility.

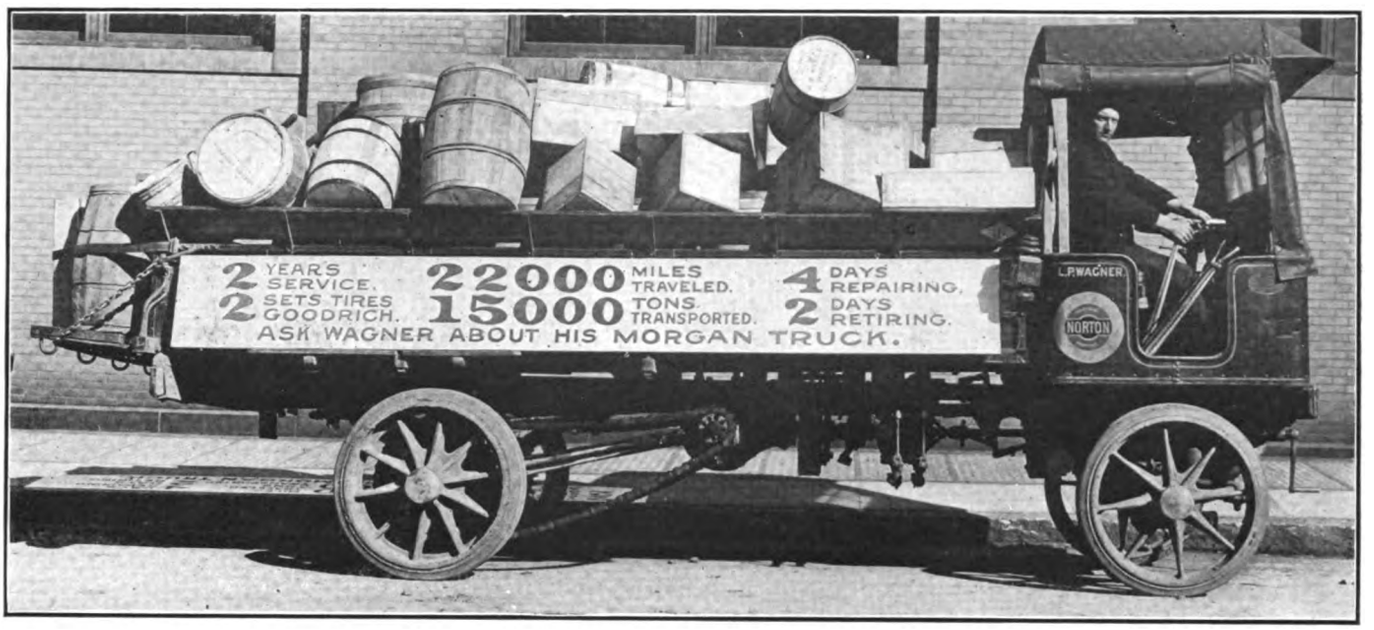
As with the motor construction all parts are made to micrometer measurements, making any replacement a simple matter. The components of the transmission are strong, durable and properly proportioned and the gears are of the very best grade of steel, accurately cut and finished. All bearings are imported annular and thrust ball type, except on the main shaft, first and second speed gears, which are roller of approved design.

The jackshaft and transmission are a unit and the former is mounted in a spherical housing, which in turn is supported by a substantial bracket secured to the main frame. This housing protects the jackshaft when the machine is traversing uneven roads as it carries a spherical joint, the application of which is depicted in an accompanying illustration. The jackshaft is of a special heat treated



Constructional Features of Morgan Truck: A, Leather Universal Attachment Between Flywheel and Clutch; B, Spherical Joint of Jackshaft for Absorbing Road Inequalities.

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Morgan Chassis Fitted with Standard Type of Body, a Machine Which Has Been in Service Over Two Years.

chrome nickel steel and operates on a heavy imported annular ball bearing mounted in the spherical housing.

Universal Joints.

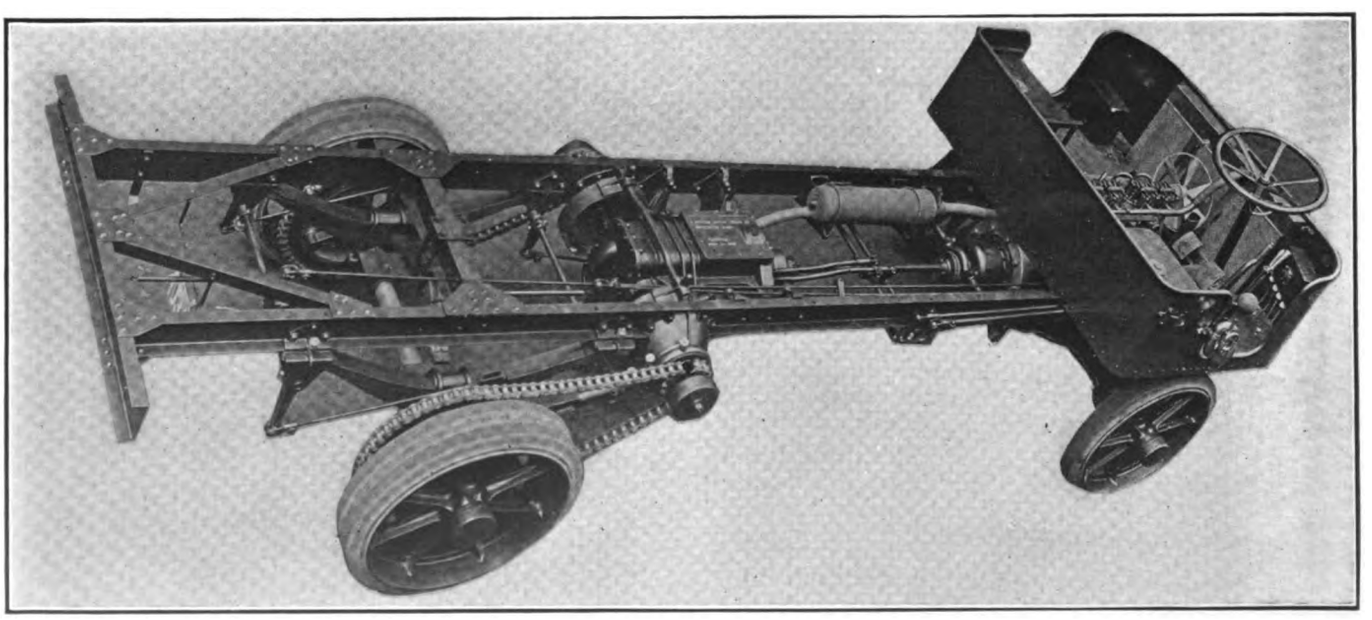
An interesting feature is the Morgan universal couplings and joints illustrated herein. They consist of rubber blocks in sections carried in a housing and the design is such that when energy is applied these members absorb all shocks such as a too sudden application of the clutch, improper changing of speeds and inequalities of road. These shock absorbers are fitted to the jackshaft and one of the same design is utilized on the drive shaft. The advantage is obvious as the units of the chassis are relieved of sudden stresses brought about by improper application of power when the vehicle is heavily loaded. These rubber members are readily accessible and require no attention whatsoever. The bevel gear differential and transmission operate in a bath of lubricant and grease cups of liberal size are fitted where necessary to the jackshaft assembly.

Final drive is by double chain, 1.75-inch pitch and the sprockets are of the best material and the teeth are accurately cut. The rear axle is of the dead type, 3.6 inches in diameter, and is constructed from nickel steel bars of round section finished on the ends to receive the radius rods, spring seats and bearings. The front axle is five-inch I beam section type of drop forged steel.

The springs are unusually strong and resilient, built expressly for truck work and are semi-elliptic both front and rear on the three and five-ton models and semi-elliptic front and full elliptic on the two-ton car. Shackles are not utilized, the springs being supported by a wearing plate, similar to that employed on heavy horse drawn vehicles. They are secured to the axles by U bolts through large seats, making for simplicity as well as great strength and rigidity. On the five and three-ton models an auxiliary semi-elliptic spring is fitted to a rigid cross member of the frame at the rear. Well designed torsion rods are employed, their design making it an easy matter to adjust the chains, as well as to insure perfect alignment of the road wheels.

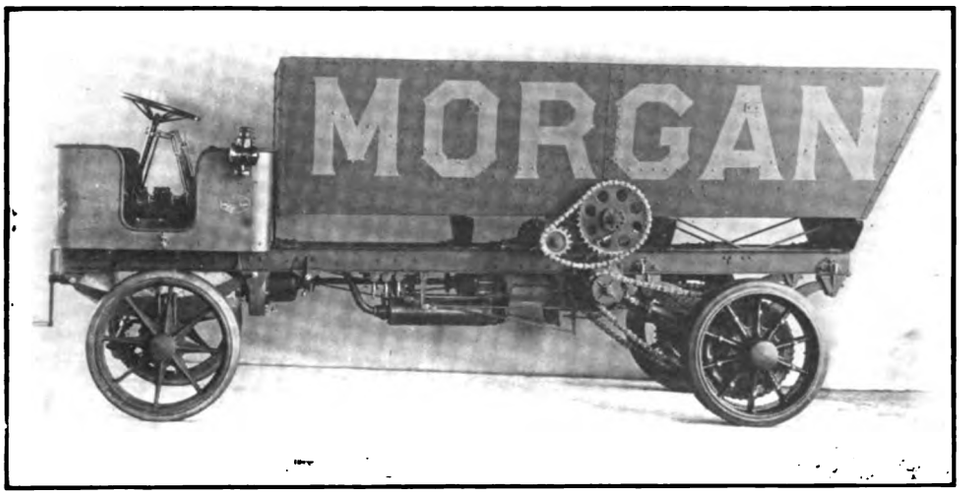
Solid Metal Wheels Employed.

Solid metal wheels of the locomotive type are employed and the rear members are mounted on liberal sized imported annular ball bearings with large, special double row ball thrust bearings, these taking all side stresses and leaving the annular members free to carry radial loads. This is an



Chassis of the Morgan Five-Ton Truck Which Is Noticeable for Accessibility of Working Parts and Simplicity of Operation.

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Morgan Screw Discharge Body, Showing Detachable Chute through Which Contents Are Discharged by Screw Conveyor Operated by Energy of Motor.

exclusive Morgan feature. Roller bearings are fitted to the front wheels which are equipped with single solid rubber tires, 36 by six inches, while the rear are dual, 36 by five.

Two sets of brakes of liberal friction surfaces are provided. The service members are two external contracting on jackshaft inside of frame and are operated by pedal. The emergency members are of the internal expanding type on the rear wheels and are actuated by the usual hand lever. Both sets are lined with asbestos, woven on wire mesh.

Although the frame is flexible it is unusually strong. It is of rolled structural steel, six-inch channel section with rivets hot driven. Two steel channels compose the side members, which are securely braced by substantial cross members and the latter are anchored by large gusset plates and corner braces. A feature of the construction is that rivets are not driven through the tension member of the frame. It is 17 feet eight inches long and 13 feet 10 inches back of the driver's seat.

The steering mechanism is of the irreversible type, constructed especially for heavy duty trucks and the steering column is equipped with a 22-inch wheel. The knuckles, arms and connections are of high grade material. The spark and throttle levers are on the steering post and the accelerator is operated by pedal.

All working parts are protected from dust and dirt, a substantial and accessible shield being fitted under the power plant. The tread is 64 inches and wheelbase 143. The fuel tank has a capacity of 26 gallons and is located in front and very accessible. The speed of the vehicle is 10 miles an hour, but this can be varied so as to suit all conditions and requirements. Believing that each kind of trucking requires its own type of body, and that each city modifies these to meet local conditions, the Morgan Motor Truck Company is prepared to furnish any and all designs to meet the desires of its customers.

Screw Discharge Body.

An interesting design produced by the company, inasmuch as it permits the unloading of coal, sand, gravel, grain, etc., without changing the position of the container, is the screw discharge body, two views of which are presented herewith. It is constructed of steel, having sloping sides, and has an Archimedian screw located centrally and crosswise of the body. Power to operate this is conveyed from the motor through a change gear mechanism, in which an extra gear and shaft lead to a chain wheel mounted on the side of the chassis.

A much larger wheel is mounted on the end of the conveyor shaft opposite to that on which the chute is attached, to which is fastened a key. When this key is withdrawn the chain and wheels rotate idly while the truck is being driven. When the load is drawn into position, the operator slips the key into place, and the motor rotates the screw, and the contents of the body are discharged. The detachable chute may be raised or lowered to any convenient position, and it requires but a few minutes to attach the device.

DETROIT'S MUNICIPAL MOTORS.

The municipal departments of the city of Detroit are to be almost exclusively equipped with motor apparatus, making it one of the most complete in the country. Types of machines for every public service, including ambulances, patrol wagons, fire apparatus of every description and coal wagons are either now in use or shortly will be. One of the latest vehicles to be ordered by the city is a dog ambulance, for which the General Motors Truck Company has been given the contract.

This will be used by the police department to pick up mad and injured dogs. The chassis is to be of G. M. C. 1.25-ton type, and the body will be of special construction, equipped with six compartments having space for 15 cages of different sizes. Each compartment will be provided with swinging doors, and watering troughs will not only provide drinking water, but will assist in keeping the cages cool. Place has been provided for a medicine chest, and also for nets and other supplies.

The department has also placed an order with the same company for a 2.5-ton truck to be used by the service men in taking care of the telegraph and telephone lines. It will be provided with a winch to assist in laying cables through conduits and other work of this nature.



Depicting Chain and Sprockets Actuating Archimedian Screw Which Is Operated by a Key Device.

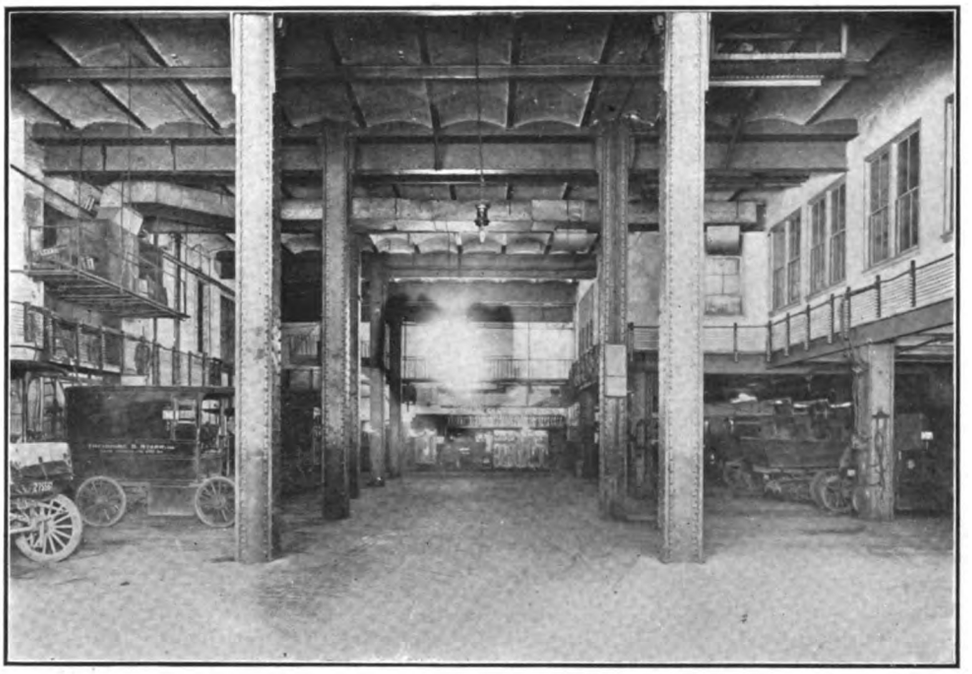
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THE EXCLUSIVE ELECTRIC WAGON GARAGE.

Public Service Station of the Yellow Taxicab Company, New York City, Established Six Years, Developed for the Owner of Few Vehicles---Practical Methods and Practise Productive of Economies and Satisfaction.

COMPARATIVELY few public garages are devoted exclusively to service wagon patronage. It is probable that the proportion of the total number is a fraction of one per cent. This condition is due to obvious reasons, the most cogent of which is the doubt by those who now have service stations as to the wisdom of giving attention to but one class of vehicle when patronage may be obtained from all, especially when the single classification is seemingly as limited as the others are unlimited. It is true enough that many of the garages give service to motor wagons, sometimes a considerable proportion of the total number, but these are the exceptions rather than the rule.

Within the past two years in several of the largest cities service stations have been established for the benefit of the owners of machines produced by several of the largest makers. These garages must be regarded as incidental to the general promotion campaigns of the manufacturers owning them, and cannot be considered as purely business propositions. In many instances the builders of vehicles have concluded that it was essential to insure the purchasers of wagons a positive service, so far as this could be done, and have decided that the most economical manner of conducting a selling campaign is to educate their customers as to the use and maintenance of their transports.



The Main Floor of the Electric Service Wagon Garage of the Yellow Taxicab Company, 110 East 25th Street, New York City, Where Upward of 60 Machines Are Given Proper Attention.

While it is evident that no person desires to be considered extravagant, it is also apparent that what might appear in itself to be a loss might also be sufficiently promotive to justify its continuance. That is to say, that while the service station conducted by a vehicle manufacturer might directly show no profit, and might be an actual loss, yet the business obtained through its attention might be so large that this deficit, when charged to promotion, would be not only a legitimate but a comparatively moderate expense.

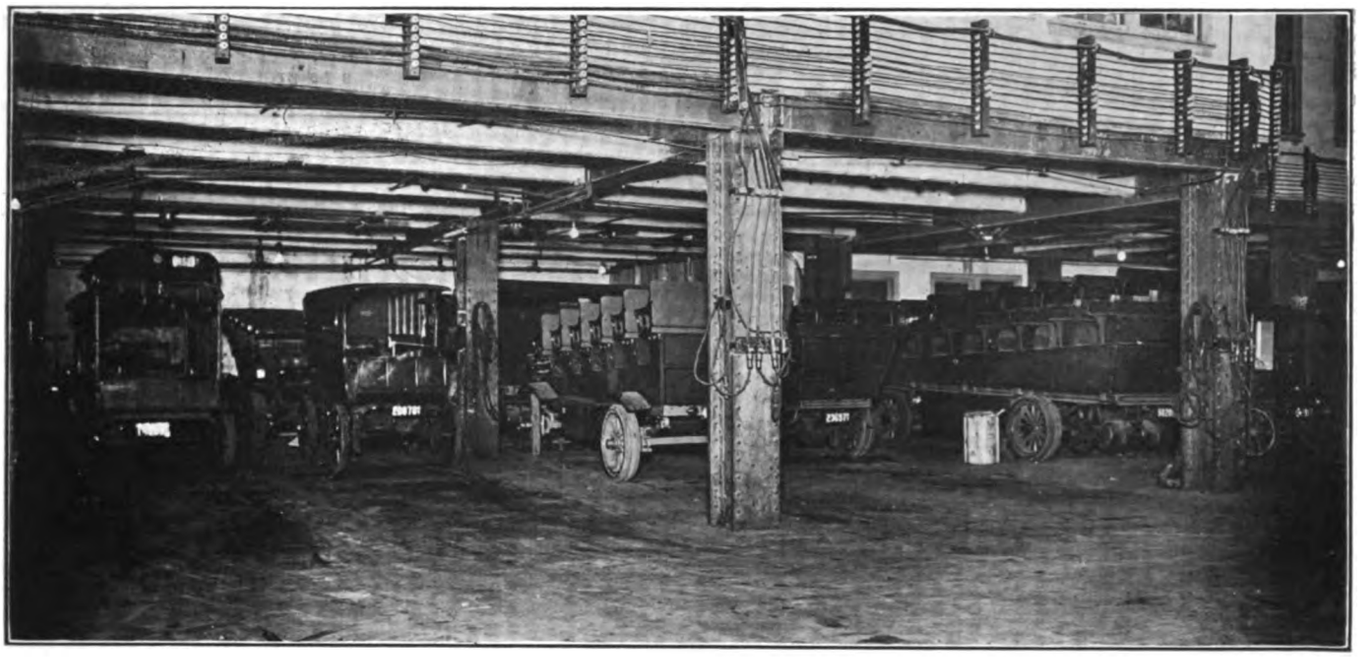
Considering stations of this character it would not be expected that the wagons would be of many different makes. In fact there would be a majority of one line, and the minority would be garaged through necessity or convenience of the owners. Under such conditions it would appear that there would be a quality of attention given to the make the station was created to promote that would be productive of better service. There would be a direct result following systematic care and maintenance of the one make marketed by the garage owner and while these were maintained at as near a uniform efficiency as was possible or practicable, those of other makes would be operated and given such care as the owners decided was advisable. With the one the endeavor of the garage organization would be directed toward insuring service and with the other the results would be dependent upon the resources and judgment of the owners.

Theoretically then, the public service station that can be devoted to a single make or type of machine would be the ideal, but this is out of the question with the average garage business. It must be conducted at a profit, or cease to exist. Being in competition with others, and revenue and net income being dependent upon volume of patronage, it is desirable to attract custom from all owners. There would appear to be a most promising field for the station that would specialize service wagon care and maintenance, but as yet few garage managers or owners have believed the custom would justify such exclusive establishments.

Without doubt the rapid multiplication of service wagons will impel the location of large stations which will be given over exclusively to these vehicles, just as the pleasure cars are now stored and maintained by numberless stations, and logically the larger these establishments and the more complete the facilities the better satisfaction can be given. The appropriate location for such garages appears to be in the business districts, close to the shops, stores and works of the owners, because it is expensive and needless to drive machines more than the demands of haulage require, and a central point of distribution is obviously the better from every point of view.

It is not to be assumed that garage patronage can be drawn from all sections of a community and for that reason it is reasonable to believe that eventually there will be whatever number the business demands, exclusive, of

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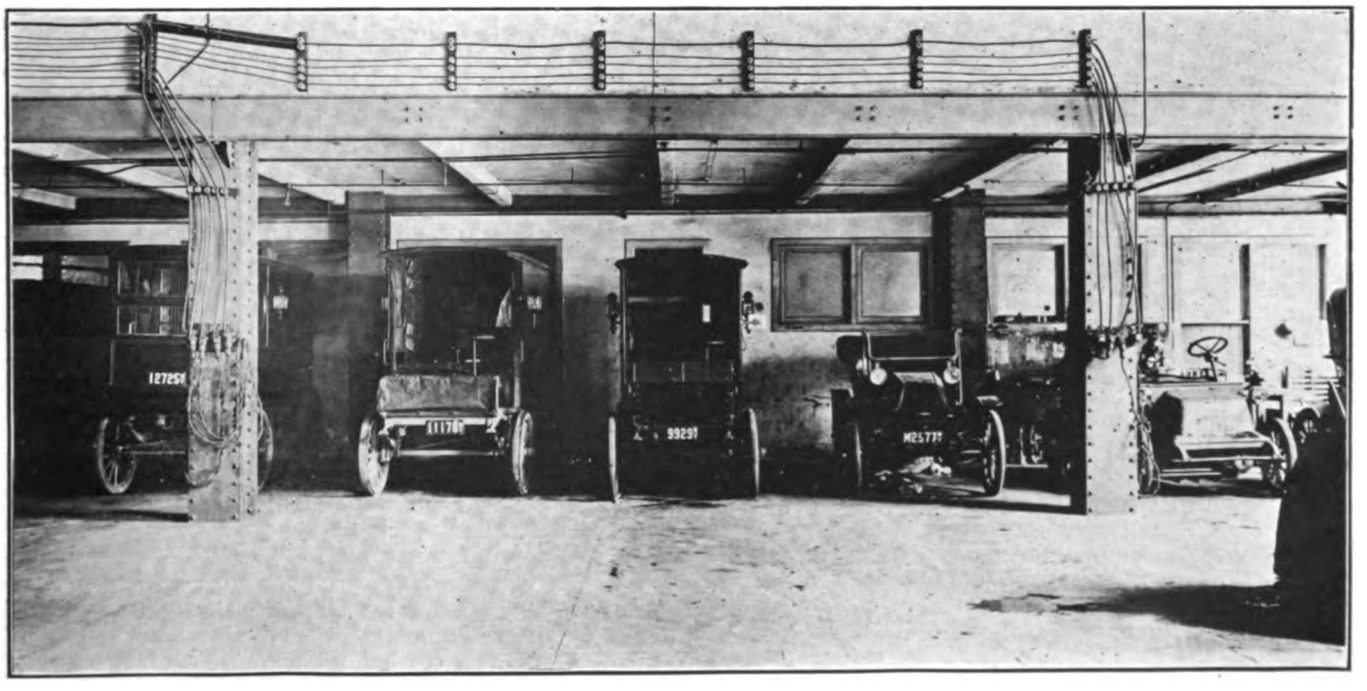


Inner Bay, at East Side of Garage, Where the Heavy Trucks and Sight-Seeing Cars Are Stored Beneath the Mezzanine Floor.

course, of the requirements of those who own pleasure vehicles.

There are, however, several public service stations that are given over to the electric wagons,, and what is probably the oldest in New York City is that conducted by the Yellow Taxicab Company at 110 East 25th street, which company succeeded to the electric garage business of the New York Transportation Company, April 15. This garage is by no means the largest in the metropolis, but it was established to serve electric service wagons and it has been continued as such and at the same location for more than six years. The station has a floor area of something more than 22,000 square feet, or about half an acre, available for all purposes, and of this a small section is required for the office and stock room. The garage shelters about 60 machines of all sizes, from the little 700-pound delivery wagon to the five-ton truck, and included among the customers are several sight-seeing vehicles that tour different sections of the city for the edification of visitors who are unfamiliar with the attractions of the metropolis. This garage was established when the building was completed and it was conducted in conjunction with, but entirely apart from, another devoted to an electric carriage service located at Eighth avenue and 49th street.

More than 11 years ago the first electric service wagons were placed in operation in New York. These machines were regarded by many as being anything but desirable, because they were limited as to speed and to mileage. Not only this, they were constructed to crude design and were in every way inferior to the machines of today. While slower and heavy, there is no question that they were enduring, and because of this endurance they were then economical as compared with the horse wagons. But the increase of the electric wagons was slow and, as many machines were placed in convenient stations and were sheltered in private garages, the demand for a station devoted



Outer Bay, at East Side of Garage, Showing a Line of the Light Vehicles and the Runabout Used to Respond to Emergency Calls.

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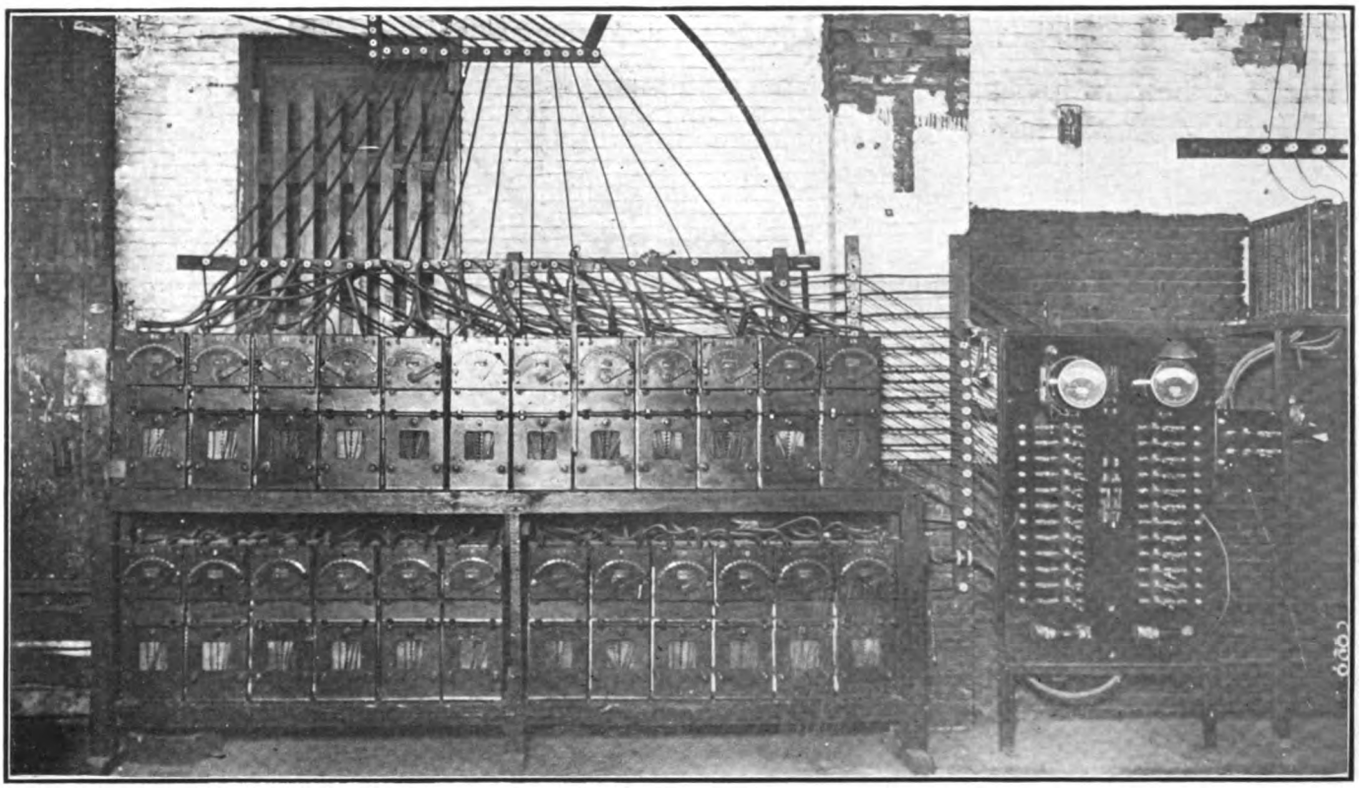
exclusively to them was seemingly very small.

The officials of the New York Transportation Company, however, believed that the utility of the electric vehicle was well established and the garage was equipped with the facilities for care and maintenance deemed essential to satisfy the patrons. The location was well chosen so far as the business section of the city and the demands for delivery were concerned, and as transient patronage was not expected the problem was to attract and retain customers who could be relied upon for constant service. In one sense this was a slow process, for it is was not only necessary to become sufficiently established to create confidence, but it was desirable to promote the use of the electric vehicle so far as this could be done by reasonable charges and by increasing the efficiency generally.

It is not to be assumed that the system first adopted was all that could be desired. As a matter of fact the operation of the garage could only be assumed and methods were determined after experience had established the conditions that were to be met with. When the station was first opened few electric wagon manufacturers had sufficiently perfected their machines to standardize them, and this was a condition that was not conducive to the greatest economy in maintenance, while the cost of batteries and of electric energy was much larger than now. These facts directed the attention of every owner upon the garage and the management and it was essential to give a service that was in every way businesslike, because it is imperative that any industrial wagon shall be operative whenever its use is desired, and the least time lost is the greatest recommendation that can be given. Besides this, it was necessary to obtain the greatest battery efficiency and to examine the wagons systematically that adjustments be made and repairs effected to prevent damage and minimize expense.

The results were not accomplished without the exercise of care and judgment and naturally experience brought about methods that were satisfactory in that the mileage of the machines was generally improved, the batteries had increased longevity and there was lessened expense. It was found practical to establish fixed charges and to insure specified attention, as well as to protect the garage against conditions that might cause a loss. The equipment was also perfected as needs were developed, and it was found possible to provide emergency repairs that were effective and economical.

It was established beyond question that the electric vehicle wears slowly, and that the depreciation is exceedingly small. It is not to be expected that machines used day after day in all weathers and generally with maximum loads are to be objects of admiration, because the service is such as will cause deterioration, in appearance at least. The condition of varnish and paint is a matter which the owner can always control, but aside from this the responsibility of the garage is firmly fixed in his mind. If the standard for economy is known the owner has ambition to still further reduce it, or increase mileage, or load beyond the normal capacity, all of which add to the problems of care and maintenance. There are, of course, those who are more conservative in their expectations, but this does not generally apply.



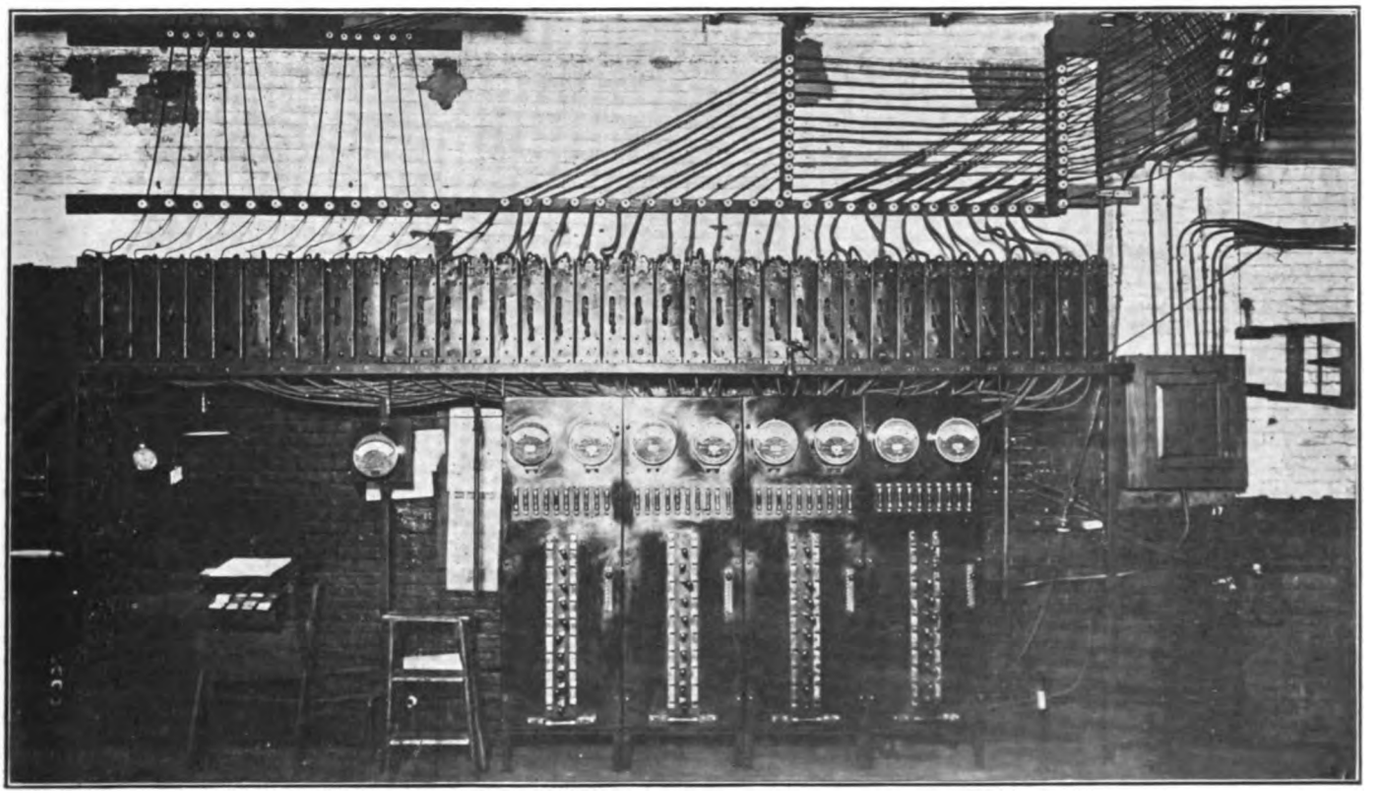
Left Section of the Charging Board at the Rear of the Main Floor, an Exceedingly Complete Installation, Sufficient for Caring for Approximately 75 Machines.

The drivers of electric trucks and wagons are not often mechanics; that is, in the sense that they are skilled workers in metals and know motor vehicle construction. It may be said that the majority of them gain their experience with the wagons after they have begun to drive. In other words, few of them have factory training and a comparatively small number have any real knowledge of the use of tools. Many of the drivers formerly drove animal wagons and were given the work because their employer had confidence in their common sense and knowledge of the city when weighed against the possible mechanical ability of a fairly trained driver. It was the experience when the garage was first established that such men were specially desirable from one point of view—that they would obey orders implicitly and could minimize the mileage travelled because of their familiarity with the city, but when they encountered a con-

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dition that troubled them they were helpless and had to call on the garage for assistance.

With the moderate speed of the vehicles there were fewer accidents of a character that would disable a wagon or truck than might be assumed. One of the principal delays was battery exhaustion, due to sending a wagon for a work when the energy available was less than was required to cover the mileage actually travelled. That is, it is imperative that no electric vehicle be started with a work that is beyond the power that can be drawn from the battery, and prudence would dictate that there be a sufficient reserve to insure against unexpected consumption of current. Being unfamiliar with electric machines there was a tendency to utilize them to the extreme capacity, with a result that sometimes they were stalled. Besides this the inexperience of drivers often necessitated sending men from the garage to remedy a condition that might have been handled quite as well by the driver had he confidence in himself. While there was not the actual damage by breakage or as a result of deterioration, there were the annoying delays that necessitated constant attention and supervision.



Right Section of the Charging Board, Showing the Rheostats, Meters and Switches, and the Record Stand Where the Charging Sheet Is Compiled.

It was the purpose when the garage was planned to have a single floor for storage, this being desired to minimize labor of handling the machines, as well as affording the drivers the least loss of time when the wagons were taken out or brought into the station. The accommodations were limited because of the need of each vehicle having its own space with sufficient room about it for the necessary work to be performed by the garage men and yet there was no space wasted. The repair shop was installed in the basement, as was the battery room, but the charging board was located against the rear wall of the building. This charging board is in two sections and from it the wiring leads to either side of the floor.

There is a mezzanine floor at the east side of the garage with sufficient height beneath it for the storage of the largest covered trucks, and under this at the front of the building is the foremen's and manager's office, from which the stock room is entered. Back of this is a room set apart for the drivers. In this is a series of steel lockers so that each driver may keep his extra clothing or other property, and there are tables, chairs and settees so that the men who are waiting or during their spare time may amuse themselves as they care to. The office, where the clerical work is performed, is at the station of the company at Eighth avenue and 49th street.

The garage impresses one as being extremely businesslike. There is no reason for a driver to remain there unless during the noon hour or while the battery is being "boosted." When the machine is delivered at the door of the garage the driver's responsibility ceases. The vehicle is then cared for by the garagemen until it is again called for, and then it is delivered to the driver at the street. Thus it will be seen that the manager or foremen assume a responsibility for the wagons and trucks and this means that the machines are ready for service at the required time or there is the best of reason why they are not. It was found that this system eliminated any possibility of misunderstanding or error, and the judgment of the driver was not depended upon when the condition of his vehicle was so important to both the garage and the owner. This interpolation is made here to establish the fact that the experience of the company dictated that dependence should only be placed on what is actually known, and not what is assumed or surmised, while the driver has no responsibility whatever.

There is no doubt that this policy has been not only productive of business, but has created a degree of confidence with the patrons of the garage that is especially desirable, and established it as a business proposition that cannot fail to appeal to a man of affairs. Besides, it placed the garage care and maintenance solidly on a basis that was not uncertain.

In conducting a public service station for electric wagons it was found that a number of different makes were owned by the patrons and to afford to all customers the

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same character of attention, care and maintenance, and to insure that the machines would be operative with the least loss of time it was necessary to carry a stock of all parts that might at any time be needed. That is, not only were different lines of standard hardware required, such as bolts, nuts, cap screws, cotters, rivets, washers, spring clips, and the like, but it was equally essential to have available the different sizes suited to all machines given attention, as well as the wearing parts of these vehicles. It will be understood that while the components of the electric service wagon are very few as compared with the gasoline motor driven conveyance, there is a sufficient number in each to make a very large aggregate in a garage stock room when proper provision is made for all the makes garaged.

The parts include rear axles, front axles, steering knuckles, tiebars, steering gear pinions, gears, worms, springs, spring shackles, bushings and bushing stock, roller and annular bearings, radius rods, brake rods, brake shoes and bands and brake facings, jackshaft shafts, differential pinions and gears, motor drive shafts, sprockets, chains, brake pedals, brackets, wheel hubs, wheel rims, motor and controller parts, cable of varying sizes, components of the different electrical devices used, and every element entering into the construction of different forms of batteries.



Corner of the Stock Room, Showing the Hundreds of Bins Containing Parts and Materials Carried in Stock, the Spare Wheels and Armatures Used to Make Temporary Repair, and the Extra Battery Components.

While it is not to be expected that a garage will have such resources as to make any replacement or restoration whenever it is desired or necessary it is desirable to be able to make temporary repair that will permit the use of a machine until a permanent work can be accomplished. Every hour a service wagon is out of commission means the loss of the cost of whatever is substituted for it, and as this is borne by the owner the need of the garage protecting him and itself against such loss is apparent. In the event of a wagon being stalled through battery exhaustion it may be towed to the nearest charging station and there supplied with sufficient energy to be driven back, but should an axle, wheel or a chain be broken, or a motor burned out through short circuiting, then it is necessary to take whatever part may be necessary and temporarily install it so that the wagon can be brought to the garage. So far as is possible every need is forestalled and should a wagon be disabled it may be hurried to the station and made ready for service. The simplicity of the electric vehicle is a large factor in its favor, because the usual causes of failure may be dealt with without much loss of time.

With public stations devoted to service wagons because of the machines being worked much of the time during the day the attention must be given at night, so that the greater part of the work upon them is done after business hours. The night shift is the larger and is added to as the needs may require. This means that every department is busy at night, while the conditions actually prevent work when seemingly it might be carried on more economically. An overhaul job or a considerable repair may progress steadily from the time it is begun until completion, should necessity require, as the vehicle is withdrawn from service, but under ordinary conditions Sundays are taken advantage of for work that would require more than a single night, provided the machines may be operated until the work can be advantageously begun. Despite the character of the work performed in the garage the equipment of machine shop is not especially varied, this including a lathe with a large assortment of tools and attachments, a drill press of sufficient size to serve all purposes, and a forge and a complete outfit of blacksmithing tools, with every hand tool that might be useful. There is a large machine shop in connection with the other garage of the company at Eighth avenue and 49th street, and there the work that cannot be handled at the truck station is completed. There is, of course, an occasional need that cannot be supplied outside of the specialized machine shop, but such is not often experienced.

The battery room, which is the most important of the garage, always contains spare batteries and cells and trays of cells that are under treatment. The stock room may be requisitioned for elements for different forms of batteries, battery cells, and whatever may be necessary for restoration and maintenance. Some of the owners of several trucks who desire to obtain the maximum service, have extra batteries than can be charged and in readiness for exchange with those in the machines. The battery room is always in charge of an expert.

In this garage all vehicles are taken on a monthly basis. Transients are not desired because of the demand for room by those having permanent attention. The charge is based on the carrying capacity of the wagons, as follows:

Capacity	Monthly Charge	Capacity	Monthly Charge
700 pounds	$40	6,000 pounds	$55
1,000 pounds	45	7,000 pounds	60
2,000 pounds	50	8,000 pounds	60
3,000 pounds	50	10,000 pounds	60
4,000 pounds	55		

This charge includes garaging the machine, washing whenever it is used, oiling all of the moving parts and filling the grease cups and packing the wheel bearings, the countershaft bearings, the chain case and completely lubricating

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YELLOW TAXICAB COMPANY

CHARGING SHEET

_____ STATION DATE _____ 19

NAME	VEH. No.	ON			OFF			CHECK	NAME	VEH. No.	ON			OFF			CHECK
		Time	Amp.	Volts	Time	Amp.	Volts				Time	Amp.	Volts	Time	Amp.	Volts	

Blank for Daily Charging Record, Arranged for 90 Entries, Form 13 Inches Length and 12 Inches Width, Padded.

the vehicle; charging the battery each day if the wagon be used, equalizing the battery whenever necessary, and a regular monthly inspection of the machine, this meaning that it is gone over and examined carefully and a statement made of the condition, this being the basis of a report to the owner. These charges are based on the use of lead batteries. Beyond this adjustments are made whenever needed, but all repairs and replacements are made at additional cost. There is no limitation made as to the current used in charging. That is, a battery is fully charged each night of the day the vehicle was used, but while it may be that a "boost" was given a battery, there is a record of this, no matter whether the charging was at the other garage of the company, or elsewhere about the city.

The attention given requires that each car be gone over at least once a week, when the different moving parts are examined to detect need of repair or adjustment, and whatever work is necessary is performed. But this does not indicate the care given. As each wagon is brought to the door of the garage by the driver he does not drive in, but awaits a shifter, who takes the machine into the building, and, if conditicns will permit, drives it to the washstand. The shifter is required to note the condition of the wagon so far as operation is concerned. He makes report to the foreman of his findings. The washers similarly note conditions while cleaning the vehicles and also make report. The drivers are required to make report to the foreman of any condition that should be brought to his observation, and that there shall be no oversight a record book is kept in which each driver notes whatever he believes is necessary. This book indicates special work for each night and when these works are finished the entry is stamped "Completed."

Should the record indicate necessary repair or replacement a special order is needed. When the service period is begun the owner is required to state in writing who is to authorize repair work, and if the driver is given authority, as is generally the case, he signs the entry in the record book. If the owner authorizes the repair this may be either verbally, in which case it is entered by the foreman, or by letter, when a similar entry is made and the letter filed.

After the vehicle is washed it is placed in its regular space or stand in the garage and placed on charge. When the charging is begun an entry is made on the charging sheet, which will take 90 entries. The entry gives the name of the owner, the number, if several are owned by the same man or firm, the time the charging was begun and the amperage and the voltage, and the time, the amperage and the voltage when the charging was completed. This charging sheet is made out daily and the record is checked by the battery man as being correct. Each day this record is copied into a book in which each vehicle garaged is entered and against this entry is the number of times the battery was

STOCK CHARGE

To_____

Date_____

Quantity	DESCRIPTION	Req. No.	Price	Amount

YELLOW TAXICAB COMPANY
8TH AVENUE AND 49TH STREET
NEW YORK CITY

No.

DATE 191

M

THE FOLLOWING RENEWALS

OR REPAIRS HAVE BEEN FURNISHED ON YOUR VEHICLE No.

APPROVED YELLOW TAXICAB COMPANY

Per

Repair Memorandum Blank, Form 8.25 Inches Length and 5.25 Inches Width, Padded.

charged. The charging sheet and the record should coincide.

The inspections are made each night, from 10 to 15 machines being inspected, the time required being from 10 to 30 minutes, the attention the vehicle has been given being a basis of this work. The record of each inspection is noted on cards and each day following the conditions as found are brought to the attention of the driver or the owner, and if necessary a letter is written to insure that the facts are not overlooked by the necessary authority. These reports and the letters indicate the work needed and the probable cost. The cards and the copies of the letters are filed, together with a note of the disposition of the subject. The batteries are inspected at least once a month, and generally oftener, when they are equalized and given other attention. The service requires that they be properly maintained, but replacements and repairs are regarded as extra work. The record of each battery is kept on cards and it is possible to learn the exact service of every battery for a period of more than five years. Before the time set for examination they are looked over and any unexpected change is detected, although the operation of the machine will usually develop any untoward condition.

Record of all the service work is kept, regular attention being charged to labor, and the supplies used to garage supplies, these being regular items of expense, but all labor on special work is kept on time cards by the foremen and from these cards the entries are made for the bills. When stock is required from the stock room a requisition is made out on a blank designated as a "Stock Charge." The entry indicates the quantity, a description of the article, the requisition number, the price of each article and the total amount. The price and the total amount are not filled in on the original, but the other entries are made in duplicate with carbon on a yellow sheet designated "Order on Stock Room," which is addressed to the stock clerk or foreman and authorizes the delivery to bearer of the articles entered on the original sheet. The yellow sheet is signed to indicate that the articles were received from the stock room. The original or white sheet, with the price and amount columns filled, is first approved as to items and totals, and is then sent to the office, where it is received by the general ledger clerk, who credits the stock room with the items and the total, this account being debited, of course, with all receipts of stock. The entries in the general ledger are indicative of the value of stock rather than character and volume, but entries on the yellow "Order on Stock Room" are posted to the stock cards, which are kept in file form, the card record constituting a perpetual inventory, each card showing the receipts of and deliveries from the stock room. The difference between the debit and credit entries should show the exact quantity and value of stock represented by any given card. The stock cards are posted each night from the stock orders and the entries are cross checked so that the record of the stock cards is not only dependable, but it can be proven with reference to any particular article in a very brief time. A general record, aside from the general ledger, shows the daily receipts and deliveries of stock. Both the "Stock Charge" and the "Order on Stock Room" forms are permanently bound in loose leaf binders.

All orders are carried in the records by number and each vehicle is further identified in the event of an owner possessing several. Thus in the "Stock Charge" both number and name, and possibly other designations will appear. When a repair job is begun two records are begun. The one is the billing memorandum, in which the garage or station is specified, and following this is the order number and the date, the name and the nature of the work, the vehicle number, and the date of completion. This blank allows 14 entries for stock requisitioned. The blank is made out by the foreman and with it, when the work is completed, are the time cards. The cost of the stock is entered in the cost column and the selling price in the selling price column, and to these are added the labor at the cost and selling price, and the whole is totalled. Under the head of remarks is entered any record desired by the foreman, who signs the memorandum as being correct.

The other record carries the order number, the date, the name of the owner and the address, and a statement of the renewals or repairs on the vehicle specified and this record is submitted to the owner or the driver (if authorized to order work) for his examination and approval. The name of the garage representative is attached to this form and when the vehicle has been looked over, if desired, to verify the record, the owner or representative is required to approve the facts as set forth. Then the bill is made out in typewritten form from the billing memorandum and this is sent to the customer. It will be noted that this record, though simple, is very thorough and that it is possible to verify every item of stock or labor from the requisition forms and the time cards, as well as the cost and the selling price. The customer does not see the billing memorandum, which indicates the difference between the cost and selling

Y. T. CO. BILLING MEMO., NO. STA.

ORDER No. DATE 19

NAME

NATURE OF WORK

VEHICLE No. COMPLETED COST SELLING PRICE

Hours @

" "

" "

TOTAL

REMARKS

FOREMAN

Form for Billing Memorandum, Form 8.25 Inches Length and 5.25 Inches Width, Padded.

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price, which is proven by the original records. Every item can be substantiated or error eliminated.

Aside from the regular monthly service charge extra work may be much or little as the case may be, but all service is moderate in cost. The attention that the garage gives is demonstrated by the fact that there are armatures of varying makes and sizes kept ready in the stock room, so that in the event of damage on the road a crew can be sent out to substitute one of these for that damaged, and the vehicle not only brought back but operated until a repair can be made. Spare wheels of all sizes are always in stock ready for substitution for those damaged. These can be similarly used. In fact, it is difficult to conceive any accident that would cause the withdrawal of a truck or wagon from service for more than a brief period, and it might be said that under ordinary conditions withdrawals are very infrequent, unless for an overhaul. A spare battery can be substituted, and minor replacements can be temporarily if not permanently made in a few hours.

The garage was established to keep the trucks in service and this is the main object. Obviously an owner cannot provide against service emergencies unless he has a large equipment and a garage of such proportions that he can afford to do so economically, while with the attention given him at the Yellow Taxicab Company's station he simply pays for what is necessary and its resources are always available. Not only this, the experience of its organization is exceedingly valuable to him, because his own must be more or less costly unless he is guided by expert advice and has the service of trained electricians and mechanics.

The capacity of the garage has been reached. There is every reason to believe that it will be increased, for there has been very rapid increase in the use of electric conveyances in New York. There are, obviously, equal opportunities for stations of a similar character elsewhere. They will be established as public confidence is created.

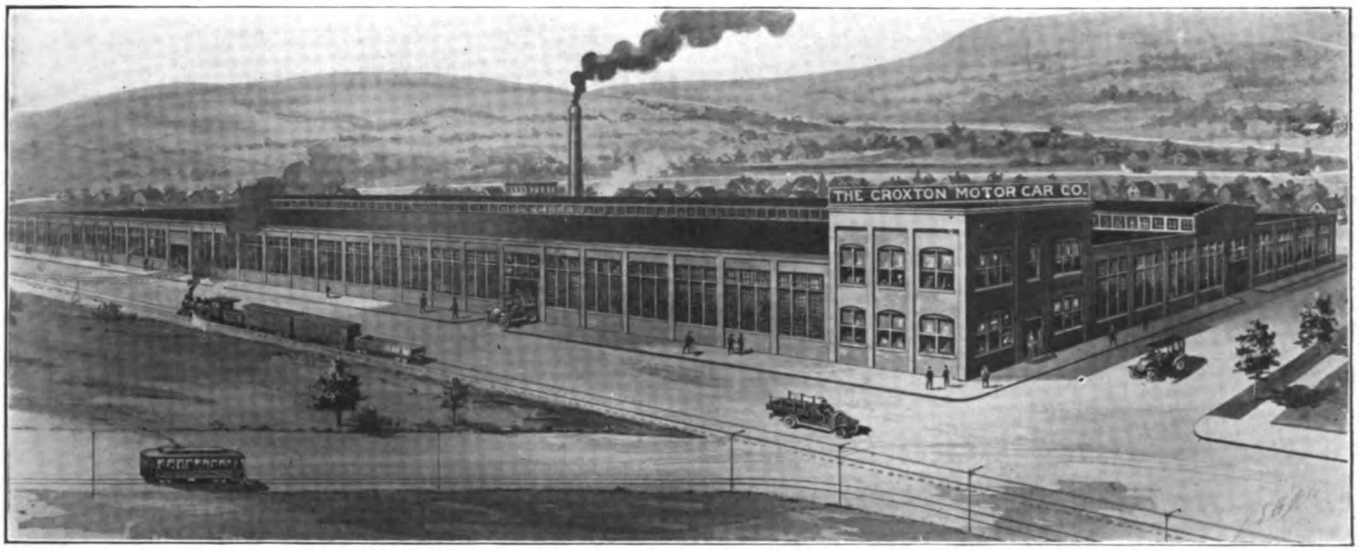
MAKER OF CROXTON TAXICABS REORGANIZES.

ANNOUNCEMENT is made by the Croxton Motor Company, maker of motor cars, taxicabs, etc., with present factory at 2260-2264 East 69th street, Cleveland, that it has prepared plans and is receiving bids for the erection of a complete new plant at Washington, Penn., which it expects to occupy about Aug. 1. The concern will be reorganized under the laws of Pennsylvania, and will be known in the future as the Croxton Motor Car Company.

J. P. Stoltz, who is president and general manager, will retain these positions under the new regime. The Washington capital is represented by the following directors: John H. Donnan, vice president of the Citizens National Bank; A. M. Linn, president of the First National Bank; A. C. Warne, treasurer of the Washington Trust Company; J. D. Bigger, director of the Real Estate Trust Company; C. S. Caldwell of the A. B. Caldwell Company; G. W. Dudderar, managing secretary of the Washington Board of Trade, and J. O. Brownson, attorney at law and director of the Washington Trust Company.

The decision to remove to Washington was influenced largely by the fact that this city has natural gas in abundance and that it is so situated that the cost run of bituminous coal is $1.35 a ton. The charge of electric power also is surprisingly low. Raw materials are immediately at hand, and labor, both skilled and unskilled, is easy to obtain.

The Croxton company has secured seven acres of land with suitable railroad frontage, and the new plant is to be constructed of structural steel, concrete and brick. The main factory will be 120 feet wide by 500 long, with structural steel spans 40 by 25 feet. Every attention will be paid to the matter of light and ventilation. The capacity will be 1000 cars a year.



Proposed Plant to Be Erected by the Croxton Motor Car Company at Washington, Penn.

PITTSBURG TO SAVE MONEY.

The authorities of Pittsburg, Penn., have figured that they can save the city the sum of $15,000 a year by operating motor trucks instead of horses, in hauling asphalt. An order has been placed for three six-ton Alcos, after a rigid investigation which showed that they could do the work with great economy. Dumping bodies are to be provided and each truck will carry material for seven square yards of street surface.

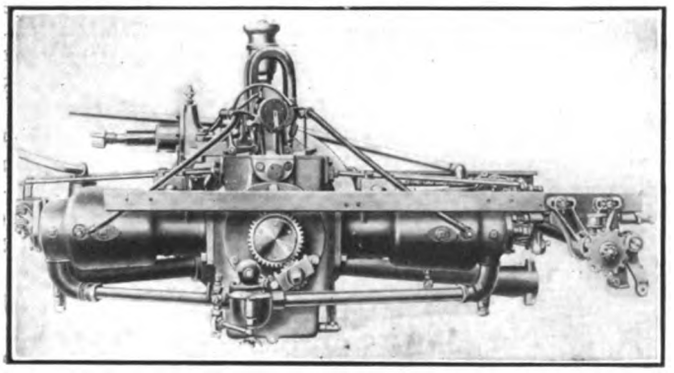
ELECTRIC PATROL FOR MEMPHIS.

Memphis, Tenn., recently advertised for bids for furnishing an electric patrol wagon with a capacity of 2000 pounds, fully equipped, including stretchers and all the usual patrol appliances. According to the announcement, the machine is to be furnished subject to 60 days' trial.

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INTERNATIONAL LIGHT DELIVERY AUTO-WAGON.

COST and efficiency in the delivery system are important factors and receive serious consideration by the small merchant contemplating the replacement of the horse drawn



Outlining Water-Cooled Motor and Its Components, All Parts Being Easily Accessible and of High Grade Material.

equipment with the more progressive mechanical transport. Equally interested is the farmer residing several miles from the city's markets and who in certain seasons makes daily trips transporting the product of the soil. While it is an accepted fact that the automobile will accomplish from two to four times as much as the horse, the first cost of the former and that of maintenance are studied carefully.

In designing its product the International Harvester Company of America, Chicago, made a careful study of the haulage problem and the numerous plants of the concern afforded ample opportunity to test out the different models in actual work. The experimentation included service under all conditions and throughout the car was subjected to severe tests before it was placed upon the market.

Although a wide variety of bodies is manufactured to meet the individual requirements of the purchaser, the chassis to which these are fitted are designed to carry 1000 and 1500 pounds. The general design is similar with the exception that the 1500-pound chassis is strengthened to take care of the additional weight. A feature of the International auto-wagon is the choice of either air or water-cooled motor, two types of 1000-pound vehicle being produced.

The air-cooled models are known as M A and A A, the latter being equipped with larger rear wheels, while the water-cooled types are also designated by letters, M W and A W, being identical with the first named with the exception of the method of cooling. Both types of motors are rated at 20 horsepower the engines being of the double opposed horizontal type and their location is such that the weight is equally distributed upon the four wheels, facilitating traction, especially in soft or muddy roads.

Power Plant Accessible.

Throughout, the power plant is noticeable for its accessibility and simplicity. It is suspended on a steel sub-frame under the body and it is pointed out by the maker that any of its components may be replaced easily, and that the services of an expert are not required because all parts are strictly interchangeable.

Both motors are of the four-cycle type, the water-cooled having a 4.5-inch bore and five-inch stroke. Cooling is effected by a centrifugal pump which takes the fluid from a large vertical tube radiator and forces it through ample water jackets. The usual fan is employed.

The crankshaft is of high grade heat treated steel of ample size and the bearings are large, being of phosphor bronze and lined with a special babbitt metal. The connecting rods and wrist pins are large, being designed for heavy service, and the bearing of the former is of such dimensions as to insure durability and smooth running. The small end of the connecting rod is fitted with phosphor bronze, moving on a hardened wristpin. All bearings are carefully fitted and tested, passing several inspections in the assembly.

The camshaft is a special alloy steel, heat treated, and the cams are forged integral. After hardening they are ground in a special machine insuring correct form and accurate opening and closing of the valves. The latter are mechanically operated and are of the rocker type making for high power efficiency. A feature is their accessibility. By removing a retaining bolt the entire valve mechanism may be withdrawn for inspection or grinding. The housing is machined to an accurate fit eliminating the use of gaskets. The working parts of the rocker mechanism are of special material, carefully hardened, and provision is made for proper lubrication, reducing wear to a minimum.

Double Ignition.

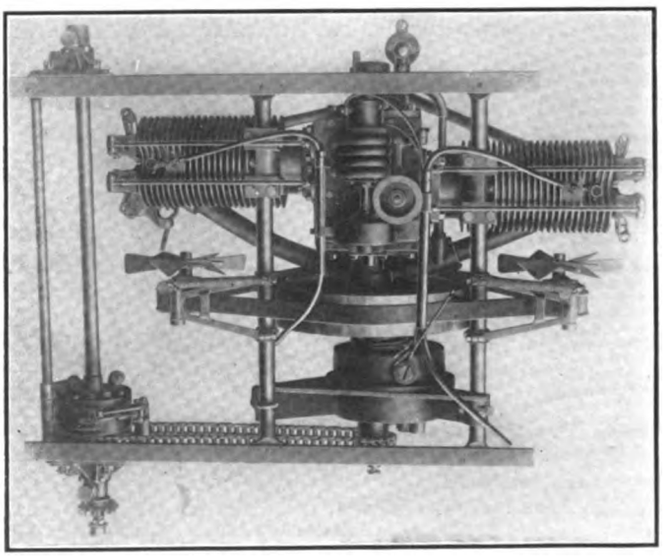
A double system of ignition is utilized, consisting of dry cells and timer, and magneto. The latter is located on top of the motor and is gear driven. A form of Oldham coupling permits the removal of the member when desired. The secondary wires are enclosed in weather proof tubing and their grouping is such that they cannot come in contact with the components of the chassis when traversing rough roads.

Lubrication is by a mechanical oiler located conveniently on the right hand side of motor and 10 individual adjustable feeds convey the lubricant to the working parts. The cams and gears within the crankcase are lubricated by the splash system and the level is always maintained properly, insuring correct operation of the motor.

Clutch and Transmission.

The clutch is exceedingly simple as well as effective. It is operated by two cams which engage two rollers on the end of the clutch levers. These contract the clutch bands around the wheel so tightly that slipping is impossible. Each half of the band is adjusted by a hexagon nut which may be turned and locked easily as the clutch is conveniently located. The latter is fitted with a special lining of long life.

One of the interesting features of the International is



Air-Cooled Type of Motor, Showing Location of Transmission, Method of Drive and Fan-Cooled Exhaust Valves.

the simplicity of the transmission and its operation. It provides for two speeds forward and reverse, all operated by one lever located at the right of the driver. The teeth of

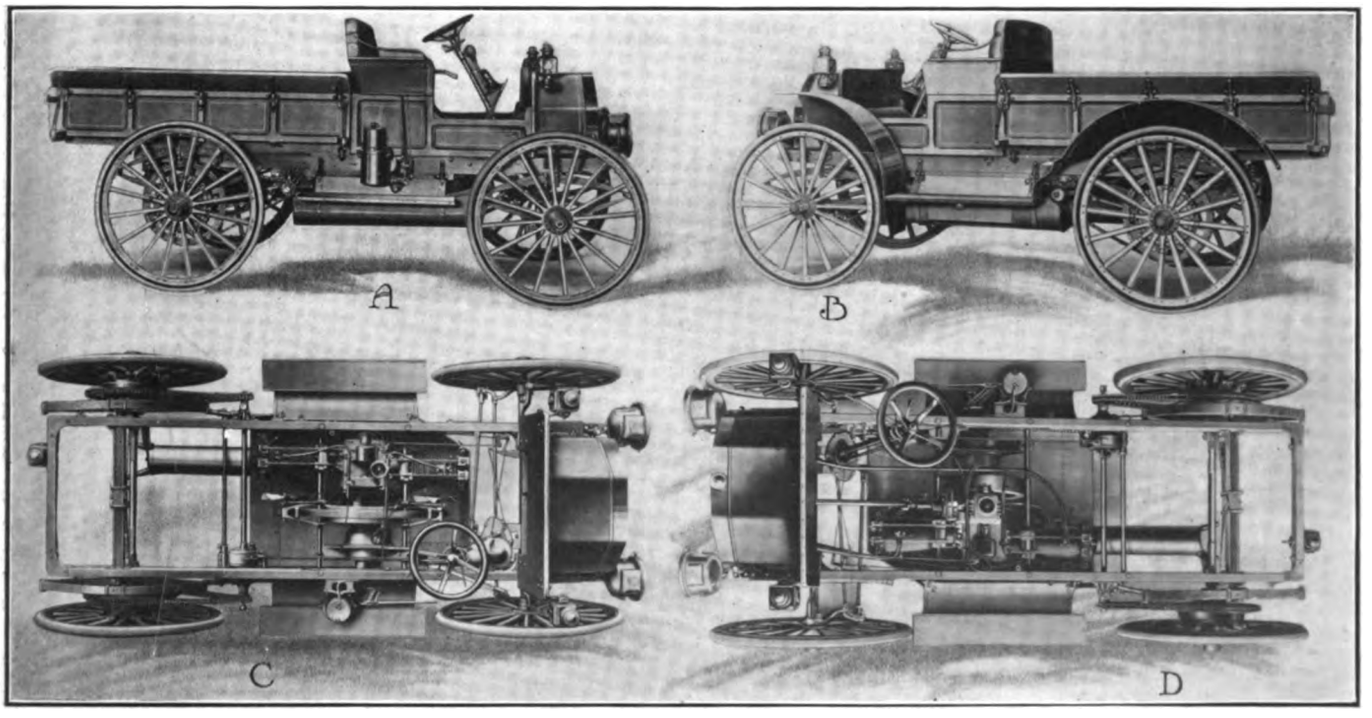
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the transmission are always in mesh eliminating any possible chance of a careless operator stripping gears. Each of the transmission members is equipped with internal ratchets, and pawls with ends which protrude through the hollow shaft engage these members. The controlling lever slide operates in the shaft and throws the pawls into contact with the ratchets in the gears as will be noted in an accompanying illustration. Whenever the use of a given speed is desired all other pawls are thrown out of engagement automatically. A simple locking device makes it impossible for the operator to shift from one speed to another without disengaging the clutch. The transmission is easily operated, it being pointed out that a child may change speeds, so little exertion is required.

All gears are enclosed in a substantial oil tight casing and operate in a bath of lubricant. The supply is replenished easily when needed as the filler member is convenient, and in addition a drain cock is fitted to the bottom of the housing, permitting the withdrawal of the old lubricant. All gears have large faces, insuring durability. They are of bronze and steel, accurately machined and finished. The addition the device makes for economy in fuel as warm air is taken in through the opening of the tube which is in proximity to the heated cylinders.

The frame is of carefully selected reinforced wood with metal sub-frame and cross bars. Springs are full elliptic, both front and rear, 36 by 1.5 inches in models A A and A W, and are securely anchored by substantial clips. Two sets of brakes are utilized, the service being of the external contracting type on differential and operated by pedal, while the lever operated emergency is internal expanding on the rear wheels. These members are of unusual size.

The wheelbase is 90 inches in both air and water-cooled models. Model A A and A W are equipped with 38-inch wheels in front and 42 rear, both being fitted with roller bearings and shod with 1.75-inch solid side wire tires. Models M A and M W are fitted with 38-inch wheels, front and rear with 2-inch solid tires. The springs of these models are 36 by 1.5-inch front and 36 by 1.75 rear. Two-inch tires are furnished for both front and rear on special order for models A A and A W, and 2.5 rear on models M A and M W. Large tires are recommended for heavy loads.



International Auto-Wagon: A, Panel Express Type of Body with Removable Flare Boards Fitted to Air-Cooled Motor Chassis Depicted at C; B, Model M W Having Two-Inch Tires and Detachable Body; D, Chassis Equipped with Water-Cooled Motor, Outlining Accessibility of Components.

pawls and other components are made of a special grade of steel and are heat treated. It is claimed by the maker that not only is the transmission noiseless but seldom needs attention other than lubricating.

Double Chain Drive.

Power is transmitted from the motor to a countershaft and thence to the rear wheels by sprockets and chains. The latter are of liberal size, and the sprockets are cut carefully and of durable material. The driving and driven sprockets are sufficiently high from the ground to be unaffected by mud. Two substantial, well designed torsion rods insure perfect alignment. The brackets carrying the countershaft are slotted and either side is fitted with adjustable bolts and locking nuts, making it an easy matter to maintain the proper distance between the sprockets. The torsion rods are also adjustable.

A Schebler carburetor is utilized and the air intake is fitted with a vertical standpipe preventing the suction of the motor piston from drawing in dust or foreign elements. In

The throttle and spark levers are mounted on the steering column at the right and the usual wheel is utilized for steering. The fuel tank is located in front, making for easy replenishment and the carburetor is supplied by gravity feed. The gasoline capacity is 10 gallons, ample for long trips.

Air-Cooled Models.

The air-cooled model is fitted with a four-cycle, horizontal double opposed motor having a five-inch bore and stroke. Each cylinder has 23 separate and distinct radiating fins insuring proper cooling under the most severe conditions of service. A belt driven fan, fitted with a tensioning device, is located opposite each exhaust valve aiding in cooling. The straight line exhaust pipe is of liberal area permitting free egress of the burnt gases.

A feature of the fan arrangement is the provision made for lubrication, oil being forced to their bearings by the mechanical oiler. All parts subject to friction are provided with grease cups in addition to the regular oiling system.

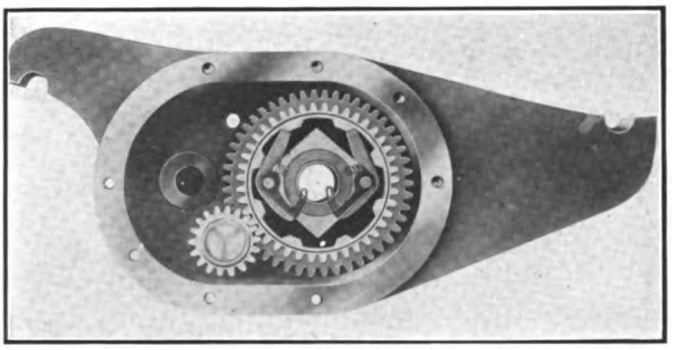
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The standard equipment includes one seat, fenders, two gas headlights, three oil lamps, generator, horn and tools. On special order the following will be supplied: Rear seat, anti-skid chains, supplementary cross springs, double top to cover two seats, top for front seat, combined speedometer and odometer, storage battery and Prest-O-Lite tank.

Variety of Bodies.

Models M A and M W are fitted with panel express type of body, 73 inches long and 42 wide, inside dimensions, and have an 11-inch panel and 6.5-inch removable flare board. Models A A and A W are equipped with the same type, the inside dimensions being 67 inches from back of front seat and 35 inches wide, with a nine-inch panel and 4.75-inch removable flare board. The panel express bodies are removable, the operation consuming but a few minutes time and permitting the use of a variety of special bodies to meet requirements.

A special top of standard construction is also manufactured for attachment to models M A or M W panel express types and is equipped with side and rear curtains, completely enclosing the body. A storm front, comprising a front and two side curtains with celluloid lights, is extra. The double top and rear seat arrangement will appeal to those who desire the use of the machine for pleasure purposes, as by it the occupants may be protected fully from the weather. The International Harvester Company of America produces a number of different body designs and points out that users of its auto-wagon are assured of efficient service as the concern has branch houses or representatives in all of the important cities and towns.



Sectional View of Constant Mesh Gear Type of Transmission, Showing Dogs Engaged in Pawls.

TORONTO TO OPERATE 'BUSES.

Toronto, Can., is to operate a line of passenger 'buses with the idea of discovering their practicability and interesting private capital. Chief Engineer Rust is preparing a report upon the matter which will be presented to the city council. It is thought that four or five machines will be run at first as an experiment, and the idea developed on a larger scale if found successful, with the aid of private capital. At present any company can operate 'bus lines on the street, as no franchise is required. It is stated that an English concern has been considering the opportunity offered by transit conditions in the city, and will probably have machines on the streets in the near future.

PIERCE-ARROW WELCOMES VISITORS.

The Pierce-Arrow Motor Car Company, Buffalo, N. Y., maker of the well known Pierce-Arrow worm driven truck, is quite a hospitable host to visitors at its factory, providing guides who follow a carefully mapped out route in conducting sight-seers about the plant. The guides are provided with instructions, the first paragraph of which reads: "It should be remembered at all times that this company is not doing visitors a favor by showing them through the factory, and the conduct of the guides in every instance should be governed by the fact that every courtesy they show is due the visitor in return for the opportunity he gave us to show him through the buildings. The outward appearance of the visitor and whether he is apparently a prospective buyer of a car, must not be allowed to govern the conduct of the guides. A general invitation to visit the Pierce-Arrow factory has been extended to every one who may be interested, and anyone coming here with a desire to see the plant is the guest of the Pierce-Arrow Motor Car Company and is to be treated as such in every respect."

MIDDLETOWN'S FIRE WAGON.

Chief Pitt of the Middletown (Conn.) fire department has given out the figures of the cost to the city of the Pope-Hartford chemical wagon, made by the Pope Manufacturing Company, Hartford, Conn., which was bought two years ago. These figures show that the machine effected decided economy when compared with the horse equipment which it displaced. During the two years it has been in service, it has answered 139 alarms, and has cost to maintain only $99.74, as compared with horse maintenance expenses of $1909.41. The respective costs are tabulated as follows:

Motor—		Horse Truck—	
Gasoline	$23.20	Feed and hay	$1654.12
Oil	4.90	Shoeing	185.95
Tires	29.75	Veterinarian	69.34
Sundries	41.83		
	$99.74		$1909.41

This shows a difference of $1809.67 in favor of the automobile, without taking into account the greater speed in reaching a fire and consequent saving to the property owners.

TAUNTON'S MOTOR CHEMICAL.

The department in Taunton, Mass., has taken delivery of a new motor combination chemical engine and hose wagon, built to special design by the Pope Manufacturing Company, Hartford, Conn. Of course, the chassis is the regular Pope-Hartford construction, but the body work follows the lines developed by Chief Frederick A. Leonard.

The rear portion is built in two compartments, each of which will hold 500 feet of regulation fire hose. Both are covered to form seats for the crew, while the ladders are so arranged along the sides as to provide backs for these seats. The chemical tank also is covered, and provided with a Fifer head, held to be the latest improvement.

It is anticipated that the new machine will displace six horses, this equipment answering alarms formerly covered by two hose wagons and a chemical engine. It is unnecessary to add that the saving in expense will indicate a decided economy.

FLORIST USES FORD WAGON.

A. W. Brendt, a florist of Indianapolis, Ind., has thoroughly demonstrated the economy and convenience of the light delivery wagon. He uses a Ford and keeps it busy from morning until night, covering the city and making frequent trips into the country, at times running 150 miles a day. One recent journey was to Romney, Ind., a distance of 63 miles, and the round trip of 126 miles was made without difficulty, with the flowers in perfect condition when they arrived at their destination. The time consumed was eight hours.

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New Commercial Car Accessories

Caldwell Gas Tubing.

The Caldwell tubing will appeal to those who have had trouble with acetylene lamps due to leaky piping, as it has been designed especially to eliminate the defects of the usual products. It consists of a heavy and high grade rubber tube covered with braid by a special process which weaves the fabric closely without diminishing the flexible qualities of the tube. The covering protects the rubber from the air, thus keeping it soft and considerably lengthening its life, and the tube is stated to be serviceable as long as the braid is intact. The weather will not affect it as it does ordinary uncovered rubber tubing, which it renders hard, so that it cracks easily, the Caldwell tubing being protected from the oxygen of the air, and retaining its flexibility. It is made by the Caldwell Manufacturing Company, 1756 Cranston street, Providence, R. I., and is inexpensive.

The Volkmar Starter.

Self-starters for motor trucks are coming more and more into prominence, and when not a part of the standard equipment, are often installed by the owner. One of the newer starters is the Volkmar, made by the Volkmar Auto Starter Company, 203 Broadway, New York City. This is of the spring type, and is especially designed for attachment as an extra accessory, requiring no mechanical changes in the car to install. Pressing a pedal on the dash releases the springs and turns the motor over several times, the two powerful springs unwinding. When the motor starts it winds the springs again, ready for the next starting. The instrument is simple in construction, having only 28 parts, and is eight inches in diameter and seven inches long. It is fastened to the car in place of the starting crank. It is made in two sizes, one for motors of up to 30 horsepower, and the other up to 60 horsepower.

Noloss Battery.

One of the newer ignition batteries, is the Noloss, made by the Burn-Boston Battery & Manufacturing Works, 9 Doane street, Boston. It is a combination of the liquid battery in the dry battery form. The batteries are delivered sealed ready for use and are of the liquid type, giving the same voltage and amperage as the regular dry battery and taking up the same space. Though a liquid is used, there are no fumes, and the fluid cannot leak, freeze, or evaporate. When not in use, the cells do not lose amperage.

Vixen Horn.

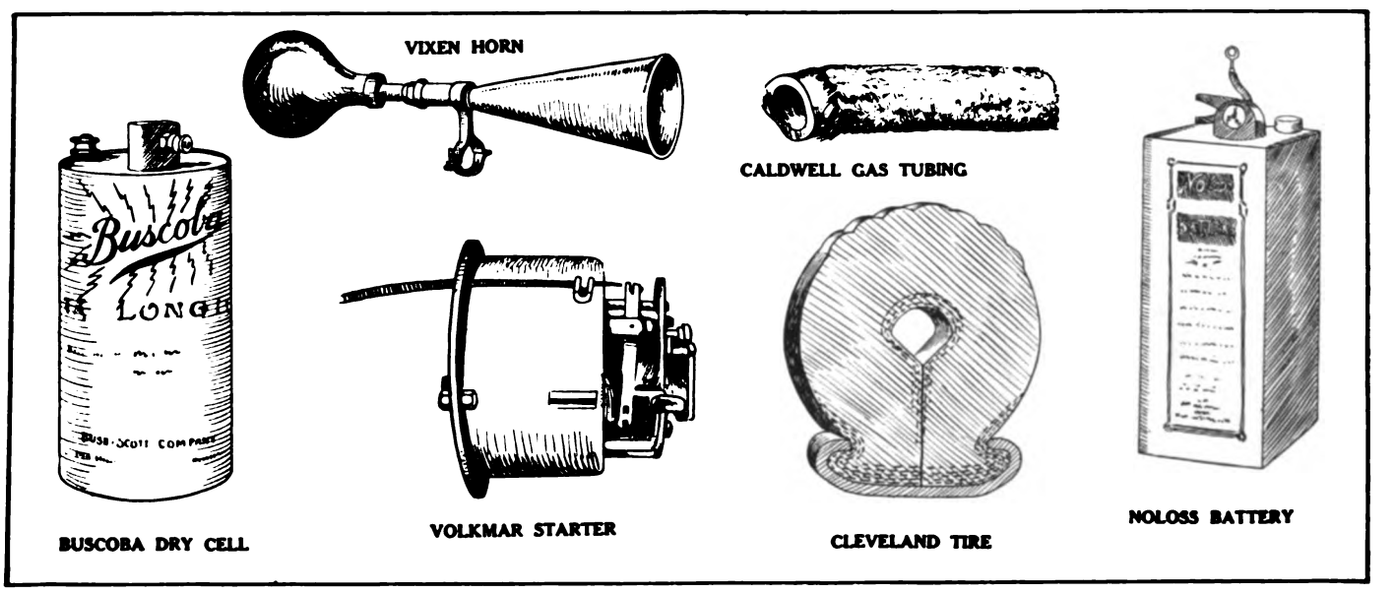
Motor truck users who have been considering the horn problem will no doubt be interested in the Vixen, made by the Motor Car Equipment Company, 55 Warren street, New York City. This is distinctly a new type, though its outside appearance resembles an ordinary bulb horn of the reed variety. Instead of the reed, however, there is a small mechanical siren which emits a characteristic sound of great penetrating power. This sound is said not to be unpleasant, and the horn can be used in both city and country.

The Buscoba Dry Cell.

The Buscoba dry cell is made by the Bush-Scott Company, Detroit, to meet the demand for a high grade special dry battery of long life and unusual recuperative powers for use with ignition systems. It is of the usual form, equipped with screw terminals, and is covered with a yellow wrapper in order to distinguish it from other cells.

Cleveland Air Cushion Tire.

This is a novelty in solid tires, made by the Cleveland Puncture Proof Tire Company, Columbus, O. It might be more properly called a non-inflated tire, for as may be seen by the illustration, it is not solid, but has an air chamber in the middle. The air in this is at atmospheric pressure only, and communicates with the outside air through a slit in the base of the tire. It is claimed that when the tire strikes an obstruction, the pressure closes the slit, resulting in the air being compressed and adding its resiliency to that of the rubber. Around the clincher, the tire is covered with several layers of friction cloth, which prevents cracking, and the tread is beaded, to prevent skidding and give a large wearing surface. The tires fit any standard clincher rim, and can be used on any wheel fitted with that style of rim. In appearance and size they are similar to the ordinary pneumatic shoe.



Views of Some Interesting and Valuable Accessories for Use on Motor Trucks, Including a New Type of Ignition Battery, Improved Gas Tubing and a Starter.

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The MOTOR TRUCK
Devoted to Motor Driven Business Vehicles of All Classes.

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STUDYING TRANSPORTATION COSTS.

One of the most important features connected with the widespread use of the mechanical conveyance is the incentive to study the cost of transportation methods. It was somewhat surprising to those interested in establishing the newer equipment to find that many manufacturers and other business men, who were able to tell to several decimal places the cost of each step in the production of goods, were utterly unable to tell the expense of getting these goods to the customer except in a lump sum. In fact, the yearly total was not known with any degree of accuracy in many instances.

When the motor truck salesman began to interest these people in the advisability of replacing antequated methods with the industrial transport, he very naturally reduced his figures to costs a ton-mile, only to find that he was discussing a situation about which the man to whom he was talking knew practically nothing. As a result, the transportation manager has become a decidedly important factor in any line of business endeavor.

A careful study of local conditions is necessary, and a comprehensive record system must be installed. This must enable leaks in the delivery organization to be discovered, as well as the cost of every item of operation in the rather complex problem which hauling presents. By a careful examination of these records, the cause of any increase in the total cost should be discovered readily, as well as leaks and opportunity for improving the system. Most truck manufacturers are able to install such systems for their customers.

The factors of economy and efficiency form the basis upon which the owner must determine whether or not he shall discard his present equipment, and they likewise present the information upon which he and the truck manufacturer or salesman should arrive at the answer to the question as to what type of mechanical transport shall be selected.

THE ARMY SITUATION.

While there has been some disposition to criticise the War Department for its apparent attitude toward the motor truck as a substitute for the army mule, the statements embodied in a recent article by Capt. Alexander E. Williams, 19th Infantry, U. S. A., would seem to indicate that much activity has been manifest on the part of the government in this particular field. Capt. Williams not only gives figures which prove conclusively the economy resulting from the use of mechanical transports, but maintains that the United States is ahead of other countries in the development of machines for field use.

It is significant that the government has decided to continue the experimentation which was begun last year in connection with the various military manoeuvres throughout the country. Apparently this has been with a view to arriving at some definite knowledge as to the availability of these vehicles for field service. If, as Capt. Williams claims, this is a decidedly progressive step, then American manufacturers have nothing to fear in awaiting the final decision of the army officials.

The effort of the department to secure information regarding the trucks now owned and utilized by private concerns and individuals is along the lines followed by the government of Great Britain. Whether or not a subsidy will result is of importance, particularly when viewed from the standpoint of the manufacturer and owner. It is conceivable that the final action of the government in this matter will prove of decided and financial interest to the commercial vehicle industry—quite as much so as if it were considered wise to purchase outright trucks in quantities.

ELECTRIC VEHICLE DEVELOPMENT.

Those who are giving serious consideration to the study of the motor haulage problem cannot help but be convinced that the place occupied by the electric vehicle is growing decidedly more prominent each month. When large concerns are to be found with equipment aggregating over 100 machines of one make, it must follow that these are giving satisfactory service, to say the least. Another significant factor in this connection is the frequent announcement of repeat orders of quite substantial proportions. It is evident that the electric has its own particular field, in which it can compete with eminent success.

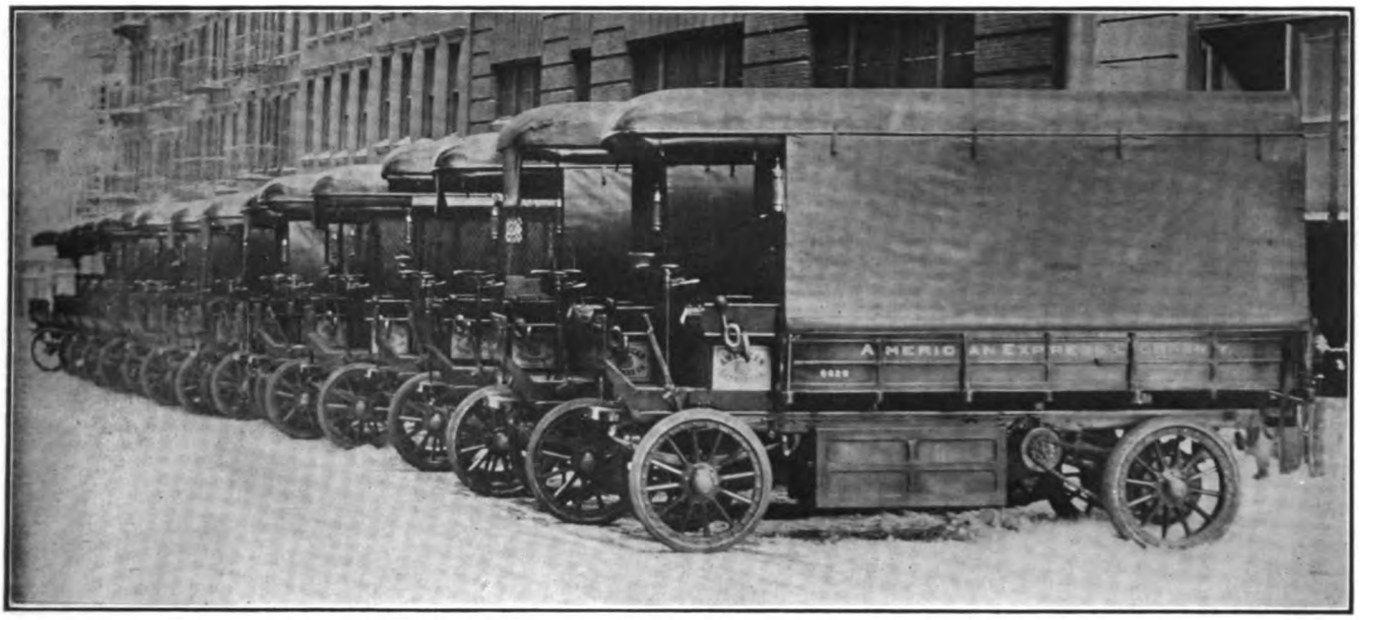
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NEWS OF THE ELECTRIC VEHICLE FIELD.

Bakers Prove Decidedly Successful in Express Service---Ice Cream Concern Favors Detroit Cars---System as Applied to Bread Delivery---Cost Figures Based on Experience of Chicago House---Features of New G. M. C. Design.

While it is true that many breweries are utilizing electric trucks in large numbers, it is significant that among the largest purchasers of this type of vehicle are the express companies. Before the American, National, Westcott and other concerns made a radical departure from their former method of delivery service, they tested out several demonstrating cars, which were placed at their disposal by the manufacturers of the country, to prove their efficiency and economy under any and all conditions.

These tests covered a period of years, during which time the express companies kept accurate record and tabulation of the performance of each car. Machines of the same type but of different makes, were put in direct competition, running under the same service conditions, and this



Fleet of Baker Electric Two-Ton Vehicles in Operation with the American Express Company, a Type Utilized by It in Several Cities.

period of experimentation was a time of discovery to the express companies.

They learned of uses for the trucks, of which even the makers themselves were not sure, and as a result of all this, the express companies were able to make logical selection without bias of the cars which had proved themselves best adapted to their needs. They are now purchasing electric trucks in large quantities. One of the most recent orders placed with the Baker Motor Vehicle Company, Cleveland, O., maker of the Baker electric, was a repeat for 28 two-ton cars for use in Washington, Baltimore, New York and Chicago.

The motor in these cars is of the special four-pole design series wound, with unusually large commutator, which is claimed not to spark or blacken under the heaviest load and to possess an electrical characteristic which permits of 300 per cent. overload. The motor and countershaft are completely self-enclosed in dust and water proof cases. They are connected by Reynold silent chain, which is enclosed and runs in oil. The armature shaft and countershaft run on imported annular ball bearings and four of these are employed for the latter to provide against possible distortion.

The steering gear and controller are connected in a very compact manner, and are rigidly attached to the chassis, being devoid of all slimsy connections. The controller is a patented continous torque drum type, and is enclosed in a dust and water proof case. Five speeds forward and reverse are provided. No pedals or switches are used in connection with this controller, and all speed changes are gradual and accomplished without waste of current.

Special attention has been paid to the matter of wiring, this being rendered acid and weather proof and so arranged as to be free from all mechanical strains. All connections are securely locked. Every part of the working mechanism requiring attention, adjustment or lubrication is made conveniently accessible from the outside of the vehicle without disturbing the body or the load.

The frame is of pressed steel of special design, giving unusual strength and lightness. A particular method of chain drive is employed, permitting the flexible suspension above the springs of the entire power plant, and a light solid rear axle construction of unusual strength. Both axles are drop forged steel with integral spring seats, and are equipped with roller bearings of standard design.

In addition to the contract mentioned above, the Baker concern has filled the following during the last 30 days: Westcott Express Company, New York City, 12 two-ton express trucks; Public Service Gas Company of New Jersey, two one-ton vehicles for construction work; Public Service Railway Company of New Jersey, one two-ton car with collapsible extension tower for line work; Denver Light & Power Company, two-ton; Malden Electric Company, Malden, Mass., one-ton; Town of Peabody, Mass., 1000-pound wagon; Cambridge Gas & Light Company, Cam-

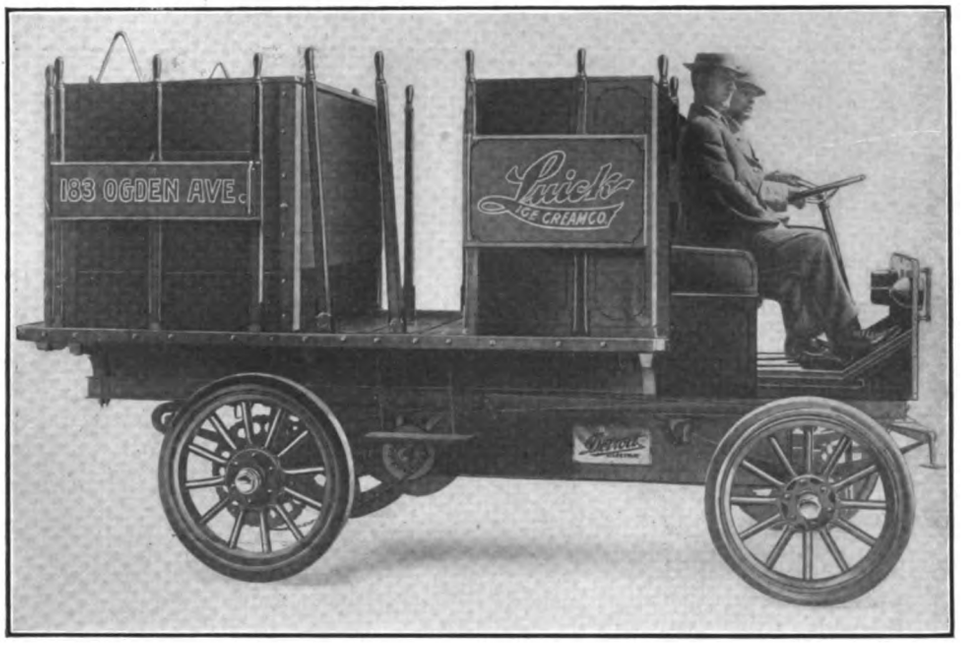
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bridge, Mass., 1000-pound; D. Goff & Sons, Pawtucket, R. I., two-ton; Southern California Edison Company, Los Angeles, Cal., 1000-pound; F. M. Christianson & Son, Akron, O., one-ton truck with special body for hauling marble slabs.

DETROIT ELECTRIC FOR ICE CREAM.

The delivery of ice cream requires some special provisions in the matter of vehicle equipment, owing to the necessity for packing the product in ice and salt. This applies particularly to the body, and the accompanying illustration, being that of an ice cream delivery wagon employed by the Luick Ice Cream Company, Milwaukee, Wis., brings out the method utilized by this concern in solving this portion of the problem.

The car is a Detroit electric of 3000 pounds capacity, made by the Anderson Electric Car Company, Detroit. It is maintained, both by the maker and the owner, that the nature of the ice cream business is such that an electric vehicle can be used to a much better advantage than one propelled by gasoline. This is due primarily to the number of short stops required on most of the delivery routes.



Detroit Electric in Service with the Luick Ice Cream Company, Milwaukee, Wis.

The truck shown has been in service for a number of months, and in its operation two men are employed. This makes it possible to serve a large number of patrons, including stores and private consumers, in the course of a day. It is covering from 30 to 40 miles daily, without difficulty, replacing three horse drawn wagons and making an excellent showing for economy and efficiency.

As is true of all Detroit electric vehicles, the car is equipped with the Edison battery, this particular set consisting of 60 A-G cells. The wheelbase is 96 inches; the tread, 62, and the road clearance, 11.5. The overall dimensions are: Length, 155 inches; width, 74, and height, 100. The height of the platform from the ground is 35 inches. Tires are solid, 34 by 3.5 inches in front and 36 by four in the rear.

WARDS IN BREAD DELIVERY.

Charles A. Ward of the Ward Bread Company of New York City, recently gave an interesting talk before the Electric Vehicle Association of that city concerning the experience of his company with a fleet of 100 light delivery electric vehicles, made by the Ward Motor Vehicle Company of New York, in the delivery of bread. The company began to utilize electric cars about six years ago, and has increased its equipment gradually, from time to time, until at present it consists of cars of various sizes and load capacities. The talk was confined to the results obtained in the Bronx, where 100 1000-pound wagons are employed.

The vehicles are of the completely enclosed type. A set of sliding doors at the rear of the driver's seat affords easy access to the main portion of the body, while double doors at the rear furnish additional means of reaching any part of the interior. The wagon sides are lined with galvanized iron, as also is the floor, this latter being made removable.

The internal arrangement of the garage and loading platforms were explained by lantern slides. Briefly, it may be said that the garage organization is extremely simple. The nominal head of the department is the plant manager. Under him and reporting directly to him is the garage superintendent, who is responsible wholly for the care of the vehicles and their condition. The plant engineer is responsible for electric equipment from the main power plant, through the charging equipment and to the end of the charging plug. Beyond this point the responsibility rests entirely with the garage superintendent. Three divisions are directly under the superintendent, these being the inspection and repair, washing and polishing, and battery charging and repair.

Three sets of records are kept, a daily vehicle report card, a five weeks' report and parts' renewal card. The first is used daily by each operator. A clean record card in a pocket in the front of the car is notification to the driver that the machine has been properly inspected, repaired, washed and charged. Should no card be found he must report immediately to the garage superintendent for correct information. Should it be found that his car must remain in the garage, a substitute is provided for the day.

The daily report is kept by the driver, until he is through for the day. It then bears his name, vehicle number and information as to the number of trips he has made, and the condition of the vehicle when it was turned in for the night. Accidents also must be reported on this card, which when completed, is turned over to the garage superintendent. The latter dispatches inspectors and repairmen, who make any necessary adjustments and repairs, oil the vehicle and turn it over to the washing department.

This completed the car is turned over to the charging department and made ready for duty the following morning. Records of all repair parts utilized, time required to install the same, the number of volts, amperes and time required to charge the battery, also appear on this card.

Each "five weeks' " card covers information for a period of five weeks on each vehicle. Such information as the following is entered: Date, condition of vehicle, battery number, miles a day, power, accident, repair and total costs, route number and any additional remarks.

The last record card is a renewal of parts sheet, which

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embodies the vehicle specifications, factory number, date put in service, and dates on which tires, bearings, batteries and various parts were replaced. This gives information regarding the length of life of various parts and acts as a check, not only on the operator and garage, but on the makers of parts and factory as well.

As may have been gleaned from the "five weeks' " card, the company closes its books once in five weeks. The dates considered in computing the cost figures herein, were taken from the card which began Jan. 29, 1912, and ended March 2. It will be remembered that the weather conditions during that period were not particularly favorable.

The records showed that during the period a total of 63,023 miles was covered by the 100 cars, with an average of 22 miles a day for each machine. The total power cost was $597.63, or 19.9 cents a day, a vehicle, and an average of .9 cent a mile. The total accident expense was $84.65, or 1.82 cents a vehicle a day, and an average of .083 cent a mile. The total repair cost, covering all items of expense in connection with the garage and the maintenance of the vehicles, was $2400.50, or an average of 80 cents a day a car, and 3.63 cents a mile. The entire maintenance cost, exclusive of interest and depreciation, for the five weeks was $3082.78, giving an average of $1.027 a day a vehicle and 4.66 cents a mile.

G. M. C. ACCESSIBILITY AND SIMPLICITY.

According to C. L. Morgan, sales manager of the electric division of the General Motors Truck Company, the new G. M. C. electric, designed by John Lansden has at least 18 important features, embodying the maximum of accessibility and simplicity. Some of these are outlined as follows: Rear springs outside of the frame to insure maximum axle strength, permitting the use of a narrow frame and giving short turning radius. The steering post is inclined. Double brake equipment is provided, each brake locking at wheel. Auxiliary springs supplement the rear semi-elliptic members, and an apparatus or controller hood is placed in front of the dash.

This latter is designed somewhat along the lines of the so-called Renault hood for gasoline cars. The accompanying illustrations bring out this exclusive feature. It will be noted that the controller, safety switch, ampere-hour meter, lamp circuits, etc., are all instantly accessible by lifting this hood. It is maintained that this location means a great deal to the garage man, because the controller has been so placed that adjustment and inspection of each and every finger is made readily. The whole assembly is amply protected by a heavy oak bumper, substantially ironed.

Another feature is the location of the battery on top of the frame under the driver's seat. This has been decided upon as eliminating unnecessary labor and removing all possibility of accident by dropping of battery crates, or short circuiting due to hanging wires, etc. In addition, the battery is in plain sight, so that the caretaker does not have to work through a trap door or around corners to get at the cells. It is claimed that the battery is assured of the best possible care under this arrangement. The housing is properly ventilated, as well as being protected against excessive chilling, two factors which make for long life and the greatest efficiency possible.

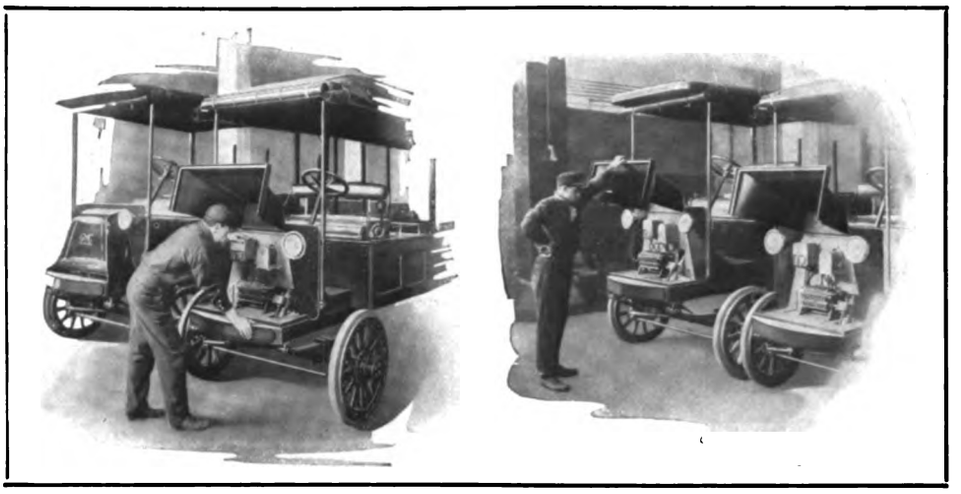
COSTS OF OPERATION.

Summarizing the results of its 10 years' experience in the charging and operation of electric vehicles, the Commonwealth Edison Company of Chicago recently issued a set of cost figures which will prove of particular interest to those who are studying the problem of economical transportation. By reducing the average ton-mile costs to comparative terms, the experience of this company indicates that it costs more than 5.25 times as much to haul merchandise a given distance in a 700-pound wagon as it does to haul it in five-ton loads. The following table explains the point:

Vehicle capacity in pounds	Relative cost a ton-mile
10,000	1.000
7,000	1.101
4,000	1.461
2,000	2.309
1,000	4.054
700	5.272

Thus, if it cost, say $500, to perform a certain haulage operation with five-ton electrics, this figure including all charges of maintenance and operation of the equipment, it would cost 2.309 times $500, or $1154.50, to do the same work with one-ton vehicles; 4.054 times $500, or $2027 to use 1000-pound wagons, and 5.272 times $500, or $2686, with 700-pound cars.

In computing these figures 24 miles were considered as an average day's run, with 300 working days in a year, giving 72,000 miles. The statement in detail, with respect to the five-ton vehicle is as follows:



Two Views of the New G. M. C. Electric, Showing Accessibility Afforded by Exclusive Hood Design.

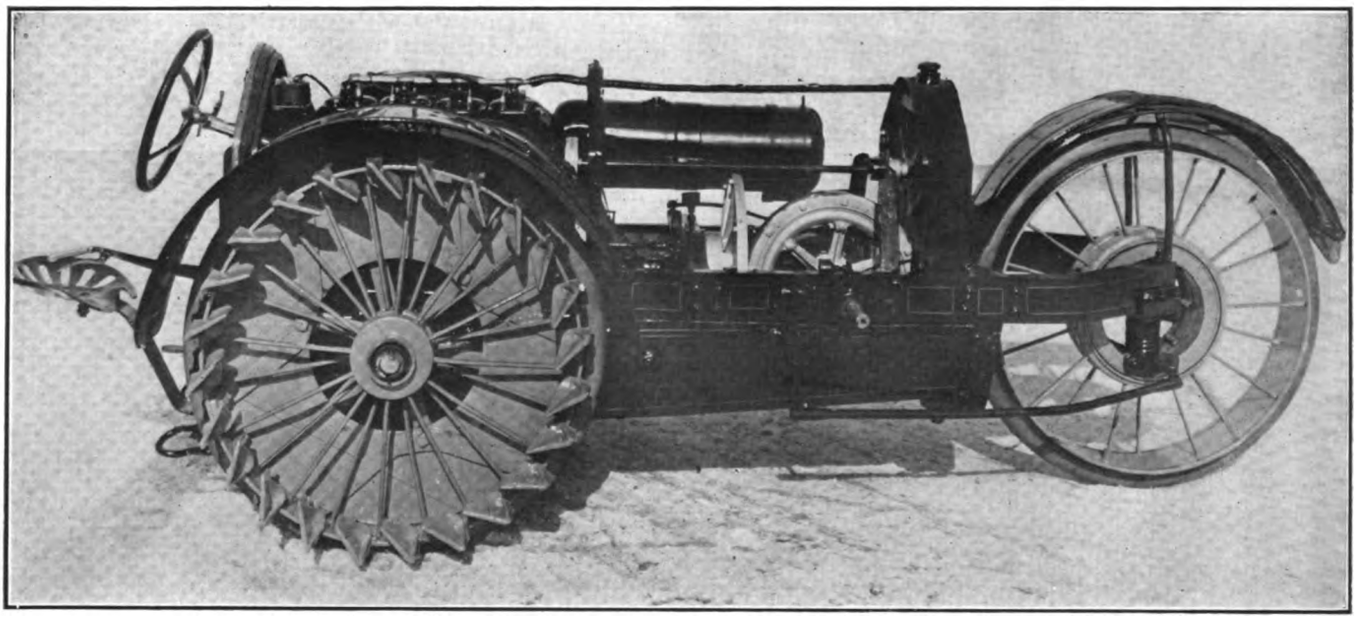
Cost for Fixed Charges—	A Day	A Year	A Mile
Amortization	$1.50	$450.00	$0.0625
Interest	.45	135.00	.0188
Fire insurance	.15	45.00	.0062
Liability insurance	.33	100.00	.0139
Totals	$2.43	$730.00	$0.1014
Renewal Charges—			
Batteries	$1.42	$425.00	$0.0590
Tires	2.06	618.80	.0859
Chains	.19	58.10	.0081
Gears and sprockets	.26	79.40	.0110
Bearings	.14	43.15	.0060
All other parts	.17	50.00	.0069
Totals	$4.24	$1274.45	$0.1769
Garage Charges—			
Electric power	$1.10	$330.50	$0.0459
Rent, light and heat	.55	164.05	.0228
Garage labor	.77	232.00	.0322
Totals	$2.42	$726.55	$0.1009
Driver	$2.50	$750.00	$0.1042
	$11.59	$3481.00	$0.4834

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CONSTRUCTION OF LAMBERT ORCHARD TRACTOR.

BELIEVING that there is a distinct field and increasing demand for a suitable motor vehicle, wherever orchards are cultivated, the Buckeye Manufacturing Company, or at least that portion of the concern represented by J. W. Lambert, who invented the Lambert friction transmission utilized in the pleasure and commercial cars constructed by it, has decided to produce a three-wheel orchard tractor, so-called. Mr. Lambert has made arrangements to erect a factory on the Pacific Coast, probably in or near Los Angeles, Cal., where these vehicles will be manufactured. It is understood that for the present this branch of the business will be conducted as a separate institution, and that no pleasure cars or trucks will be built in this plant.

Three views of the new machine are presented herewith, and it will be noted that it presents several features not hitherto seen in tractors of a similar character. Of course, the rear wheels are the driving members, while the front is utilized for steering. The position of the driver, at the extreme rear, is such as to make it necessary to carry the steering column, which by the way, is similar to that utilized in ordinary automobile construction, forward to a point nearly under the centre of the chassis, from which it is taken to the front wheel by the usual arrangement.



Side View of Lambert Orchard Tractor with Hood Removed, Showing Location of Power Plant, Friction Transmission and Other Components, Also Construction of Road Wheels.

The requirements of an orchard tractor are such that an extremely low machine practically is a necessity. In plowing and working the soil it is desirable to drive underneath the trees and as close to these as may be necessary for properly cultivating the ground. Having this in mind, Mr. Lambert has designed a machine that is but 42 inches in height. This accounts, in a measure, for the placing of the driver at the rear. It also will be noted that the skeleton seat is extremely low, although at a sufficient height to permit the operator full view ahead.

Another demand upon a machine designed for working in an orchard is that it shall be able to turn short, so that there may be no wasting of space at the ends of the rows of trees. This explains the three-wheeled construction, inasmuch as it will be admitted that a vehicle of this type is capable of making the shortest possible turns.

The very character of the surfaces over which the tractor is expected to work calls for ample traction with the driving wheels. In this respect the Lambert vehicle has much to commend it. It will be noted in the first place that all three wheels are fitted with a broad band of steel. On the rear members, the tire may be said to be in three sections. On the inside, next to the frame is a solid rubber tire, which is somewhat wider in diameter than the remainder of the wheel, so that it carries the weight of the vehicle when the tractor is traversing hard surfaces.

Next to this is a continuation of the flat steel band, but with projecting cleats, or plates, which dig into the soft ground and check the tendency of the wheel to slip. Outside of this there is a ring of plates, continuations of the projecting cleats, but set at a slightly different angle, which work in the same manner and still further augment the tractive effort when needed. The cleats, or plates, automatically clear themselves of earth.

As to the construction of the remainder of the rear wheels, it will be noted that the wheel itself is in two parts. That nearer the frame is in effect a broad steel ring, from the inner periphery of which short spokes lead to the central hub. The outside portion is composed entirely of strong steel spokes leading from the hub to the felloe carrying the broad steel band. Inasmuch as these wheels are expected to support a major portion of the weight of the vehicle and its load, as well as to provide traction, this design is regarded as extremely essential.

The front wheel is assembled about a very large hub, which is essentially two rings, the outer carrying the inner ends of the spokes and forming a part of the wheel proper, and the inner remaining stationary, so far as rotation is concerned. Within this inner ring is the pivot upon which the wheel turns in steering, this crossing the diameter vertically. Strong steel spokes connect the outer ring with the broad steel band. This latter extends beyond the central solid rubber tire on either side, and comes into play when this sinks into the soft earth.

It is obvious that in order to provide maximum efficiency under all conditions, an orchard tractor must be utilized for other purposes than working in the orchard. It must be available for hauling fruit to the packing houses in trailers, for instance. For such work, the cleats are

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eliminated, the rubber tire carrying the whole of the weight.

Because of the unlimited number of speeds available with the Lambert patented friction transmission, it is maintained that the Lambert orchard tractor will prove especially desirable. J. W. Lambert was one of the four pioneers engaged in the stationary gas engine manufacture, and has continued in this business for almost 25 years. For 12 years he has been actively interested in the production of Lambert friction driven automobiles. This experience has led him to believe that his latest vehicle will be an unqualified success.

With this system of transmission, it is maintained that it will be possible to operate the tractor while plowing at from 1.5 to two miles an hour, haul loaded wagons to the packers at a speed of say six miles an hour, and return empty at from eight to 10. Such a variation of speeds is particularly desirable, and the use of the Lambert transmission does away entirely with complicated mechanism.

It will prove of interest to note the construction of this transmission. On the rear end of the driving shaft is mounted the driving wheel, or friction disc. This wheel is of aluminum with one side milled smooth and even, and with the other webbed to give strength and lightness. It is perfectly balanced and so designed that no matter where the pressure may be exerted with reference to the face, the load does not cause a special stress upon the journal in which the shaft end is mounted.

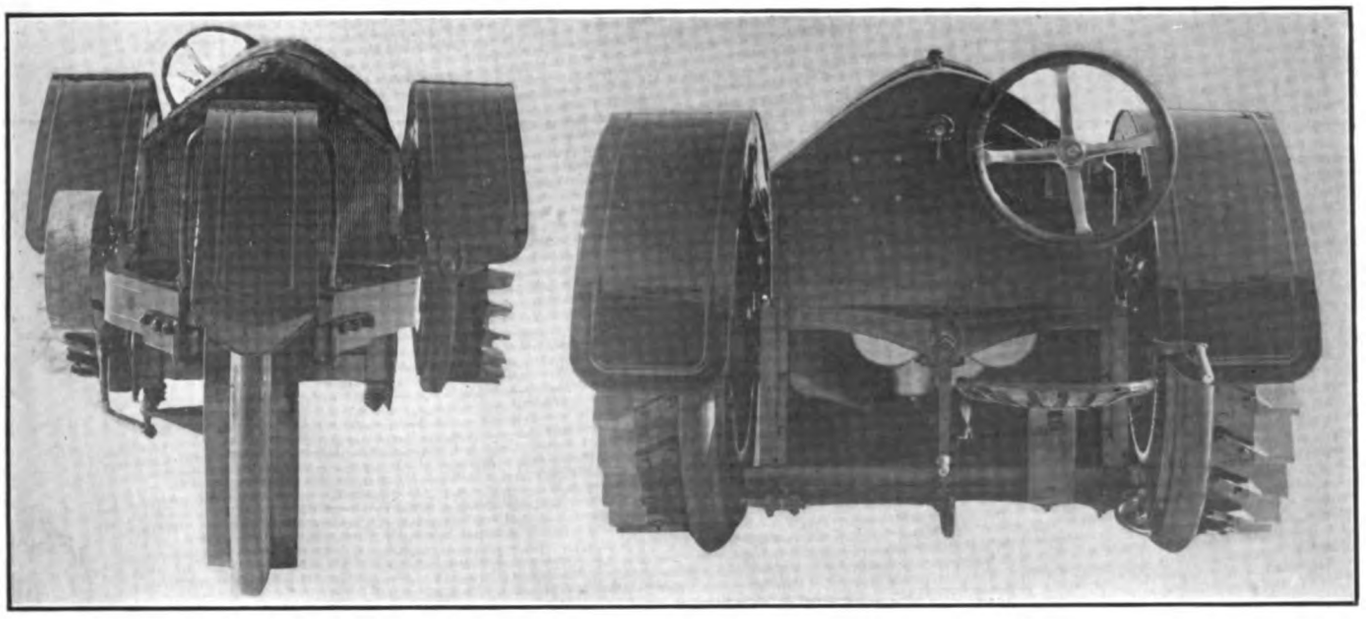
The wheel being coupled to the driving shaft, is moved backward or forward slightly to either clear or engage with the driven wheel, mounted on a cross shaft at one end of which is a sprocket. This driven wheel may be moved on the shaft crosswise of the chassis frame.

Normally, the position of the driven wheel may be assumed to be in the centre with reference to the face of the driving wheel. The periphery of the latter is normally just clear of the face of the former, this position corresponding to that generally termed as neutral with the conventional forms of gear transmission.

It will be remembered that the principle of the friction transmission is that based upon the fact that when two wheels are touching each other they revolve in opposite directions. Therefore, when the driving wheel is forced backward, having reference now to the construction as applied to the Lambert pleasure cars and trucks, into contact with the driven wheel, and when the edge of the latter touches the face of the former near the centre, the lowest speed is obtained. As the driven wheel edge is moved across the face of the driving wheel toward its periphery, the velocity of the former is increased until it revolves at the same speed as the latter, which is always at engine speed. Forward or reverse movement of the vehicle is obtained according to which side of the face centre of the driving wheel the driven wheel may be applied.

With the orchard tractor, however, the drive is first forward to the friction wheels, or discs, thence backward to the rear road wheels. As a result it is necessary to apply the edge of the driven discs to the face of the driving disc in exactly the opposite manner to that employed with the Lambert pleasure cars and trucks.

The motor employed is rated at 40 horsepower. The four cylinders are arranged vertically, and the whole power plant is mounted directly in front of the driver and over the rear wheels. The radiator, however, is supported on springs at the front, as in the usual construction. Ignition is by means of a high-tension magneto. It will be noted that every working part of the complete assembly is thoroughly enclosed to protect it from dust and grit.



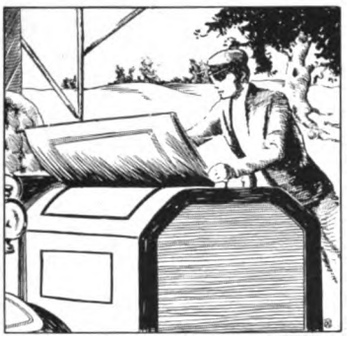
Lambert Orchard Tractor as Seen from the Front at Left; Rear View at Right, Bringing Out Additional Features of the Tire Formation.

It may be mentioned that the usefulness of the orchard tractor is by no means confined to that of plowing and working in the orchard, and to hauling wagons to the packing establishment. The design also admits of driving farm machinery, one of the disc shafts projecting through the frame, as shown in an accompanying illustration. This takes a belt pulley, which forms a part of the regular equipment of the machine.

Mr. Lambert and the Buckeye Manufacturing Company believe that in the Lambert orchard tractor they have an all-around machine which will prove invaluable to the fruit grower, and there seems to be no reason why it should not serve a useful purpose in other fields, particularly on the so-called small farm. The same features which make an appeal to the orchard man will prove decided selling points in other lines.

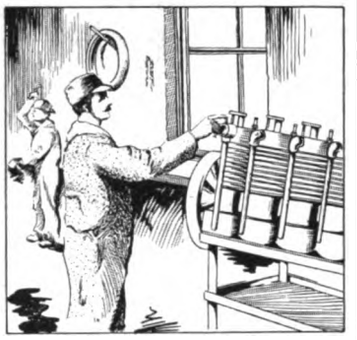
The Chicago office of the General Vehicle Company, Long Island City, N. Y., maker of G. V. electrics, has been removed to the sixth floor of the Otis building, La Salle and Madison streets, and will be in charge of W. W. Witherby, succeeding P. O. Chrysler, resigned.

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AINTS·FOR·PROPER MAINTENANCE

A Department for the Owner, Driver and Repairman.



SELECTING FILES.

The average operator in purchasing files for the tool kit does not examine these members except to note that the size be correct and that they are of the desired coarseness or fineness. In selecting a file it should be balanced on one finger midway of its length, and struck lightly with some hard body. If the tool be a good one it will ring almost like a tuning fork. The file should next be held nearly level with the eye, the light falling obliquely up its teeth, which should present a perfectly regular and even appearance viewed from either end. The color should be dull, silvery gray, free from spots or mottling, except at the end of tang.

Files should be kept in a rack in the garage and should not be thrown in a drawer among other tools. If one or two are carried in tool kit on the car, they should be

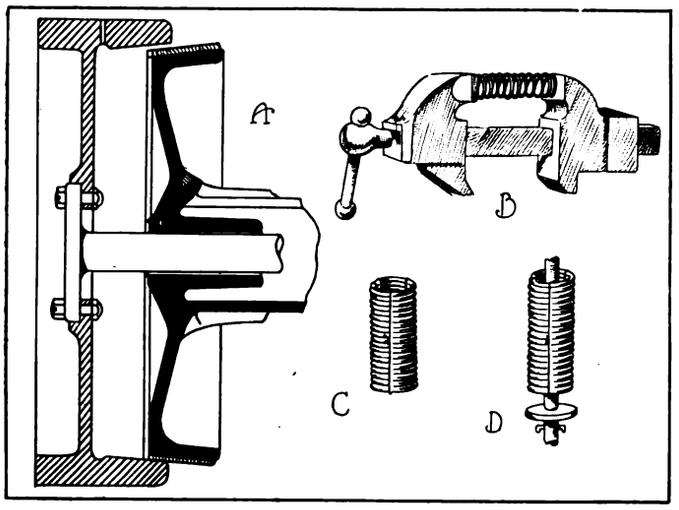


Fig. 1—Some Garage Hints: A, Showing How Worn Clutch Bushing Causes Clutch to Drag, Creating Gear Changing Difficulties; B, Method of Compressing Valve Spring in Vise; C, Outlining How Spring Is Tied; D, Depicting Its Replacement.

wrapped separately in paper or cloth to prevent injury to their teeth.

The novice is apt to utilize the first file that comes handy, sawing backward and forward, but he will soon discover that the tool cuts on the forward stroke only, and that if he relieves the pressure on the return movement he will husband his strength, and the teeth of the file also. In time he will buy 12-inch files and be particular as to the use to which they are put. It is poor practise to employ a new file for work on solder. These members when new and fine should be reserved for brass and similar metals. To file well is quite an accomplishment as the novice will probably note after surveying his attempts to obtain a smooth and even surface.

SOME GEAR SHIFTING TROUBLES.

The operator of the modern commercial vehicle rarely experiences difficulty in changing from one speed to another, as the manufacturer has overcome those troubles prevalent in the early types of pleasure cars. Many of the latter, however, have been converted over into mechanical transports and in some lines of business appear to give good service.

It is not uncommon to note that some operators of these types in changing speeds cannot make the shift without the movements being attended with more or less grinding of the pinions, a noise disagreeable to the driver as well as the experienced motorist. This clashing of the pinions is not always the fault of the operator as an expert driver may have trouble in making a quiet shift when certain conditions exist as with a worn clutch bushing or when the design is such that the inertia of the flywheel is not overcome.

In order to effect a silent meshing the pinions to be engaged must rotate at approximately the same speed, and if one be turning faster than the other, the slower member must be brought up to the same number of revolutions as the other, or vice versa. This is usually accomplished by decreasing or increasing, as the case may be, the speed of the motor which imparts energy to the female portion of the clutch and thence through the male member and shaft to the constant mesh gears of the transmission.

Worn Bushing.

If in withdrawing the male member it continues to spin it is obvious that the gears of the transmission will also rotate and that the meshing of pinions will be productive of a grinding noise as the gears are being meshed by force, especially in effecting a change from a high to a lower ratio. It is also possible that the continued movement of the male member may be due to its dragging, caused by a worn clutch bushing, such as outlined at Fig 1 A. It will be noted that the bushing is so worn that the clutch drops down on the spindle, and that the periphery bears against the female member even when the clutch pedal is depressed to its fullest extent. The contact may be slight but enough friction will be set up to cause the female portion to impart motion to the cone member.

These bushings are frequently overlooked in the matter of lubrication, resulting in the wear outlined. It is an easy matter to test for dragging by throwing out the clutch with the motor running and noting if the male member comes to a complete stop. It continues to rotate, even though slowly, the bushing should be examined for undue wear.

Clutch Stops.

If the design of the clutch be such that the inertia of the flywheel cannot be overcome through proper operation, it is poor practise to utilize the chamfered edges of the pinions as braking members to reduce their speed in gear changing.

The inertia of the flywheel may be overcome, however,

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by the fitting of a clutch stop or brake, its design depending upon that of the clutch. At Fig. 2 are presented several practical designs adaptable to the cone or expanding type of clutch and these may be constructed and fitted by the average driver. Their object is to retard partially or wholly the spinning of the clutch shaft and to enable the operator to change up or down as the case may be without grinding the pinions in the gearbox.

The stop outlined at A is suitable to a car having a cross member upon which is mounted the device. It consists of a five-inch round metal rod which is threaded at one end, and fitted with a wooden block having a leather facing at the other extremity. To the cross frame is bolted a T piece and the latter is threaded to take the rod, which is held securely by lock nuts. This arrangement permits for adjustment as well as for wear.

Another form of clutch stop is presented at B. It consists of a piece of spring steel, one end of which is slotted to engage with the studs of the transmission casing, while the other is bent upward as shown in the sketch, and a piece of hard leather riveted to the end. This method is preferable where the design of the car will permit of its use, as it is made easily and by means of the slot can be set accurately. Being constructed of spring steel it will give more or less and will not be so harsh in its action as the stop previously described and will be found to be equally efficient.

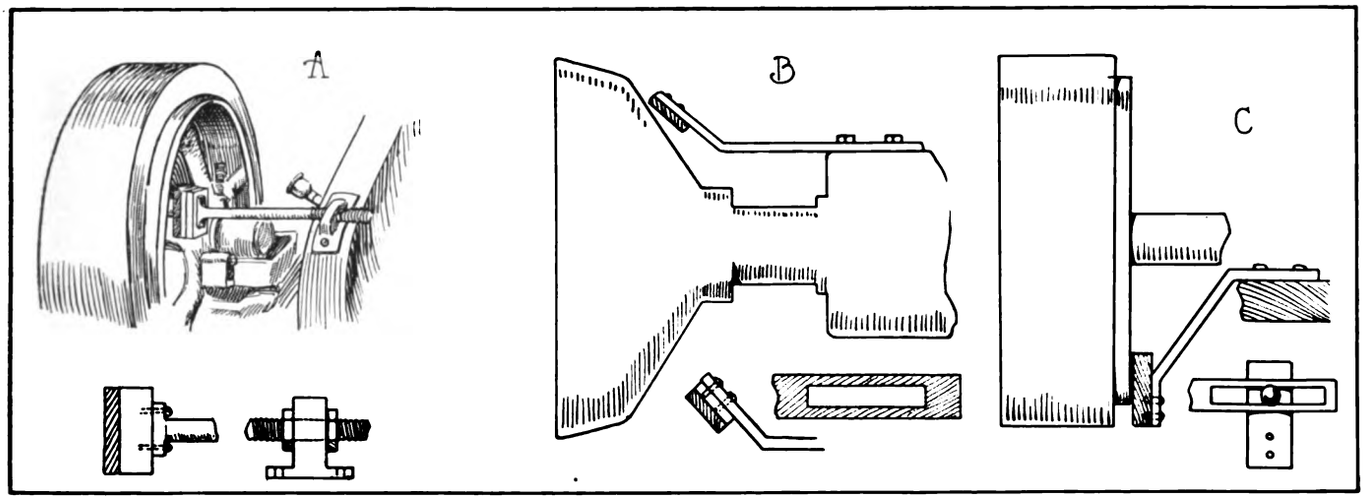


Fig. 2—Practical Clutch Stops Designed to Overcome Inertia of Flywheel: A, Adjustable Rod Attached to Cross Frame Member; B, Steel Spring Bolted to Transmission Casing; C, Method of Fastening to Frame.

Where the design is such that it cannot be placed upon a cross member or on the gearbox, the sub-frame may be utilized, and at C is outlined a method of attaching the braking device. A plate is bolted to the frame and the former drilled to take two bolts, these being employed to lock the stop proper. The latter is constructed of spring steel and slotted to permit of adjustment for position as well as wear of the leather pad. In setting the device, the clutch is thrown out and the stop moved forward until it comes in contact with the periphery of the female member, when the bolts can be locked securely.

Adjusting Stops.

In adjusting these devices it should be borne in mind that they should not be so set that a harsh engagement will follow. Their object is to slow down the spinning member to the required speed for meshing of certain pinions in the gearbox. In utilizing the stop in changing gears it will require but a short time for the driver to learn the "feel" and if properly adjusted and operated will make changing up or down an easy matter and eliminate the undesirable grinding noise. These stops may be made easily by the average driver with a working knowledge of taps and dies, and the material can usually be found in the garage, or purchased from a nearby machine shop.

REPLACING VALVE SPRINGS.

In attempting the removal of the valves for grinding the novice is liable to experience more or less difficulty in overcoming the tension of the springs unless the valve lifting tool be of an efficient design and particularly adapted to the type of motor. Although it usually is an easy task to remove the cotter or retaining key, the replacement of this member is troublesome, especially if the lifting tool should slip.

A simple method of replacing the springs is to compress these members in a vise as shown at Fig. 1 B, after which they are tied as indicated at C. The spring should be secured on three sides as outlined in the drawing and compressed just enough to clear the slot in the valve stem. It is then an easy matter to slip the spring over the stem, replacing the collar and retaining pin, as indicated at D, after which the cord is cut.

TIRE PUMP HINT.

One of the most exasperating features of changing shoes after a puncture is to discover that the pump leaks and that enough pressure cannot be secured to overcome that of the valve. The leak generally will be located in the connections, that utilized for attaching the tube to the valve stem being the chief offender. The trouble may be cured temporarily by taking a handkerchief or strip of thin cloth and wrapping it snugly between the connection and the hose, making several turns. If the tire appears to pump hard, that is, considerable strength is required, remove connection and loosen valve stem. The latter should be readjusted and tested for possible leaks upon completing the inflation of the shoe. It is surprising to note the number of valves discarded as imperfect which simply require cleaning to be as efficient as ever. Dust or dirt may collect on the seat preventing proper action.

A LUBRICATOR DEVICE.

Some cars are fitted with an oiling system which includes a glass sight feed on the dash. These become stained after much use and it is difficult to note at a glance whether or not the lubricant is dropping. Then again some are so located that the light is poor. This may be overcome by placing a piece of mirror back of the member which enables one to see the drops of oil as far away as the lubricator is visible.

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TREATING SULPHATED PLATES.

When, on test, the efficiency of a storage battery sinks to 50 per cent. or lower, the plates should be removed and washed thoroughly with distilled water. They are then placed in a cell containing a two to five per cent. solution of caustic soda in water, and the charging current sent through in the usual way. If the sulphate on the positive plate should not disappear during the time of the ordinary charge, and the solution gives an acid reaction with litmus paper, more caustic soda must be added to the solution, and the charging continued until the plate has the usual chocolate appearance. The plates should then be removed from the soda, well washed, replaced in the sulphuric acid solution, and the charging continued until gas begins to be given. Many cells have their efficiency raised from 25 to 75 per cent. by six hours' charge, and many electricians believe that any plate which will hold together will repay treatment by this method.

INSTALLING DRY CELLS.

Careless installation of both dry cells and storage batteries is responsible for difficulty in starting the motor when cold. The average driver does not give these members or the coil the attention that was formerly done, when the magneto was not a part of the standard equipment. Dry cells being utilized for starting purposes only, are apt to be neglected, creating ignition troubles as well as the expense for new members, when a little attention would have obviated the trouble.

When metal battery boxes are employed, and these not lined with wood or some insulating material, the cells should not be thrown into the container and merely connected; they should be packed tightly with waste or paper to prevent their jumbling about and care should be taken to see that the lid of the box does not come in contact with the terminals.

Sometimes the storage battery has to be removed for charging or repairs and its place taken by a set of dry cells. These should not be placed in a box where a storage battery has been used previously until the interior of the container has been scrubbed thoroughly to remove all traces of acid, otherwise the zinc of the cells will be attacked and destroyed quickly. Instances are known where a number of dry cells have been destroyed within a few days by the acid left in the battery box in which a storage battery was used formerly. In washing the car care should be taken to prevent water from reaching the cells, for if these members become wet a loss of current is likely to ensue. The same will apply to containers which do not exclude the rain.

DIRECTION OF CURRENT.

When charging storage batteries and there is any doubt as to whether the current is alternating or direct, it can be ascertained by approaching the lamp with the pole of a bar magnet. If the filament remain steady, it is direct. If on the contrary, the current be alternating, the solenoid will be disturbed and the filament will be alternately repelled and attracted, and set to vibrating rapidly.

NUT LOCKING KINK.

Parts retained by a lock nut and subject to considerable vibration are liable to work loose. Sometimes it is not practical to utilize a lock washer. A simple method is to make a washer of stiff and heavy paper and if care be exercised in setting up the nut the latter will not work loose as the paper is a non-conductor of vibration.

MACHINING WORK SQUARE.

It is considered a difficult task to machine a piece square in a lathe without a special attachment, but it can be done as follows where there is no other machine at hand: Clamp a toolmaker's vise to the face plate and place the piece to be machined in it with enough projection to permit of facing off one side. Then place the finished side toward the fixed jaw and machine the next face, and so on until the work is completed. If care be taken in clamping, the job may be done to a surprising degree of accuracy and in a short time.

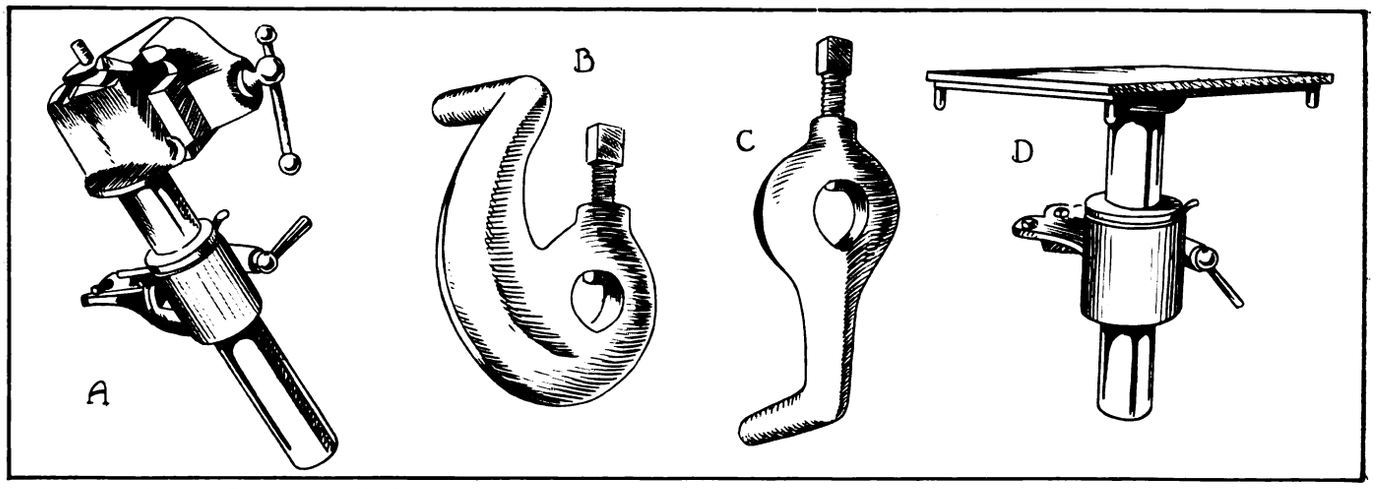


Fig. 3—Mechanical Devices Applicable to the Repair Shop: A, Universal Adjustable Vise; B, Safety Lathe Dog; C, Ordinary Member; D, Surface Plate Utilized with Universal Vise.

UNIVERSAL VISE AND SURFACE TABLE.

A vise having a universal adjustment which makes it possible to hold odd shaped as well as ordinary parts, is being marketed by the Victor Vise Company, Springfield, O., and is presented at Fig. 3 A. In addition to a swivelling base which provides for angular adjustment the vise can be raised or lowered to any convenient height. It may also be rotated about the axis of its supporting column. These various adjustments permit the workman to obtain the best light on lines or prick punch marks indicating finished surfaces, as well as eliminate stooping or awkward working positions.

A rigid position is secured easily by a single clamping lever, and when a vertical adjustment is made, the vise is automatically held until the lever is tightened by a locking collar on the stem. The device is made in four styles and a like number of sizes.

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At C is shown an accessory to the vise and this surface or table can be mounted in the base as depicted. The plate may also be detached from the stem and utilized on the bench the same as an ordinary member. They are made to suit individual requirements.

SAFETY LATHE DOG.

The repairman familiar with the lathe realizes the danger connected with the utilization of the ordinary lathe dog with an unguarded set screw which tends to catch in the clothing. This is especially true when filing. Elmer J. Michaud, South Windham, Conn., has brought out a safety lathe dog which is so shaped that the machinist is protected. The tail of the dog is curved around in front of the set screw on the leading side, this being located according to the direction of rotation. The tool is easily attached and replaced. The safety dog is illustrated at Fig. 3 B, and the ordinary member at C.

SPEED TABLE FOR TWIST DRILLS.

The speed and feed of high speed and carbon steel twist drills, when drilling mild steel, are important, and it is generally desirable to keep the cutting speed comparatively low, to avoid overheating of the drilling point, and consequent waste of power. E. G. Wrigley & Co., Birmingham, England, has compiled a diagram which was published recently in the Practical Engineer of London, and which is presented at Fig. 4. The values given are not experimental or test rates, but intended for every day practise. They may, however, be exceeded under favorable conditions.

CORRESPONDENCE.

MOTOR TRUCK cordially invites the owner, driver, repairman, sales agent and manufacturer to discuss subjects pertinent to the mechanical transport in these columns, believing that the automobile industry and those closely allied with it will be benefited thereby. Complete information dealing with the construction, operation, maintenance and repair of the commercial vehicle will be published upon the receipt of a communication addressed to the editor of MOTOR TRUCK. Suggestions of a mechanical nature, or facilitating repairs and adjustments, should be accompanied by a rough sketch which will be redrawn for publication. All communications should be accompanied by the full name and address of the sender, but for publication purposes the name will not be used unless desired.

Storage Battery Plates.

(1)—I would like to be informed in regard to the Faure type of storage battery plates as to whether the active material, oxide of lead, applied in a paste form is the same for both the negative and positive plates and how the difference between these members may be distinguished.

J. WALLE.

Brooklyn, N. Y., May 6.

The active material is not the same. In the Faure or pasted cells lead plates are coated with minium or litharge made into a paste with acidulated water. When dry these plates are placed in a bath of diluted sulphuric acid and subjected to the action of an electrical current, by which the oxide on the positive plate is converted into peroxide and that on the negative reduced to finely divided or porous lead. The positive and negative can be detected easily by their color after formation, the former being a brown or chocolate, the latter a light gray.

Cause of Ringing Noise.

(2)—Am driving a Chase air-cooled truck and when operating fast with the motor hot and laboring, the pistons seem to ring, which I think would be unusual with a water-cooled engine. Can you tell me the probable cause of the noise?

P. E. FISHER.

Wheeling, W. Va., May 10.

The noise referred to is probably due to preignition caused by carbon in the cylinder, the material igniting the mixture and producing a metallic knock, a condition which could exist with the water-cooled motor as well. A loose connecting rod will create a similar noise. The cylinders should be examined for carbon deposits and these removed. If carbon collects easily it is due to an excess of oil. The instructions of the maker should be followed as to the lubricant and operating.

Case Hardening.

(3)—I noticed a reference made to case hardening in MOTOR TRUCK. I presume it is a method of hardening metal. Will you explain how it is done and what effect it has upon the metal?

G. L. ANDERSON.

Chicago, May 23.

When iron or steel is heated to redness or above in contact with charcoal or other carbonaceous material, the carbon gradually penetrates the metal, converting it into high carbon steel. The depth of penetration and the percentage of carbon absorbed increase with the temperature and length of time allowed for the process. In the old cementation process for converting iron in "blister steel" for remelting in crucibles, flat bars were packed with charcoal in an oven which was kept at a red heat for several days. In the Harvey process of hardening the surface of armor plate, the plate is covered with charcoal and heated in a furnace for a considerable time, then rapidly cooled by a spray of water.

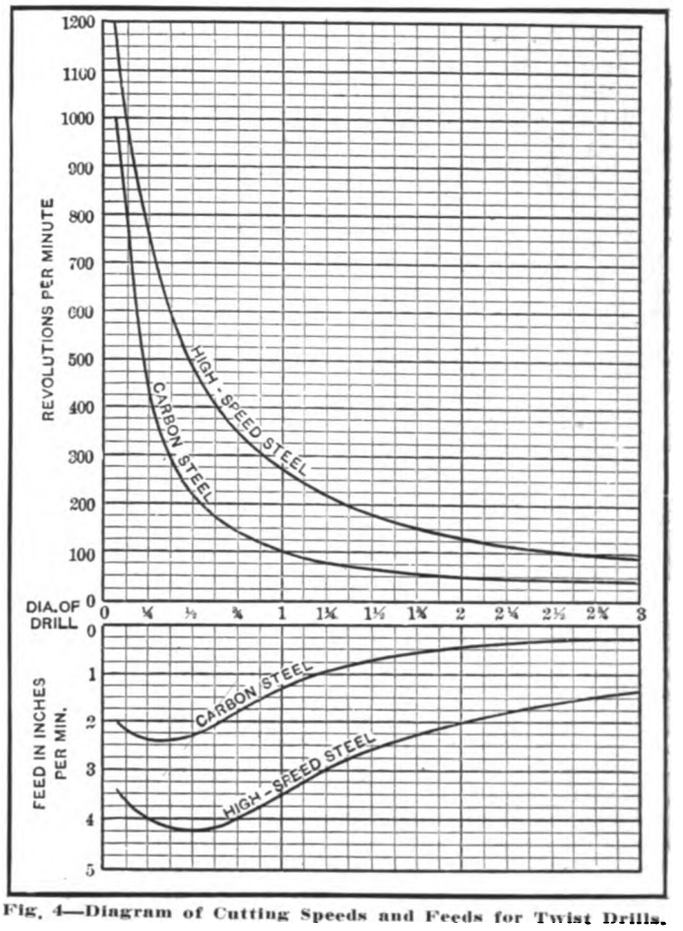


Fig. 4—Diagram of Cutting Speeds and Feeds for Twist Drills.

In case hardening, a very hard surface is given to articles of iron or soft steel by covering them and packing in a box or oven with a material containing carbon, heating them to a redness while so covered, and then chilling them. Many different substances have been used for this purpose, such as wood or bone charcoal, charred leather, sugar, cyanide of potassium, bichromate of potash, etc. Hydrocarbons, such as illuminating gas, and gasoline are also used. The general effect of hardening is a slight increase in bulk, which is reduced by tempering.

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FEATURES OF NEW KELLY ONE-TON TRUCK.

EMBODYING constructional features making for simplicity, durability and accessibility, as well as for economy in maintenance, important factors in the mechanical transport, the new one-ton model announced by the Kelly Motor Truck Company, Springfield, O., is of particular interest. Inasmuch as this concern is a pioneer in the commercial car industry its product enjoys an enviable reputation for consistency, both in contest and service, and its success is due to the high grade material utilized and skillful workmanship employed.

The components of the chassis are manufactured in the company's extensive plant and in the numerous operations involved the limit of error in production with a majority of parts is held to .001 of an inch while others are to an even finer measurement, a system employed in the manufacture of high grade pleasure cars and one making for economy in upkeep of the vehicle. Interchangeability is a feature emphasized by the company, special jigs being utilized even for the drilling of cotter pin holes, and it is pointed out that when necessary to replace a worn part it will fit into place perfectly without any adjustment whatsoever.

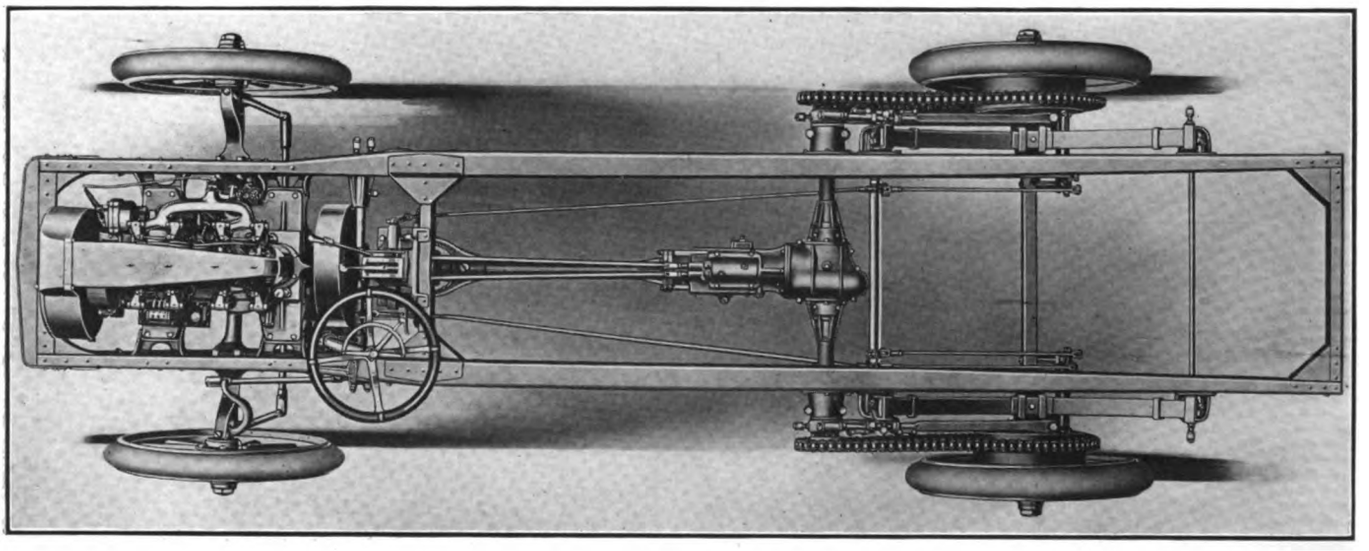
The motor is located under the hood, the company maintaining that the average driver will give it more attention than if it were placed otherwise, and that the design of the chassis is such that the load distribution is identical with that of the two and three-ton models—78 per cent. on the rear wheels and 22 on the forward members. Experience has convinced the maker that such a distribution contributes to economy in tire upkeep, and cites the performance of the winning three-ton Kelly truck in the Chicago-Detroit contest, in which cost of operation, maintenance and tires were important factors.

The four cylinders of the four-cycle power plant are cast singly, having a 4.375-inch bore and 5.125-inch stroke, and although rated at 30 horsepower according to the S. A. E. formula, will develop considerable in excess of this rating. A special high grade, close grained gray iron is utilized and the cylinders, pistons and rings are machined accurately and ground carefully, insuring uniform compression and a perfectly balanced motor.

The rocker type of valve is employed, these members being of liberal size. The operating mechanism is sturdily constructed, and means are provided for lubrication and accurate adjustment. A feature is their accessibility. By removing four nuts they may be taken out quickly, facilitating grinding when necessary. All are interchangeable. The intake members are located on the right and the intake manifold is of Y construction and of such design that each cylinder receives its proper and proportional amount of mixture. The exhaust members are on the left hand side, having a well designed and accessible manifold which reduces back pressure to a minimum.

The crankshaft is of a high grade steel, ground accurately to size, and its bearings are of liberal dimensions. These are carefully adjusted and tested in the assembly of the motor. Particular attention has been paid to the design of the cams and tappets, these members being noiseless in their operation, as well as constructed of hardened material to resist wear. All timing gears are of a special grade of steel, cut by special machinery, and their mesh is such as to provide durability and quiet operation.

The crankcase is divided, machined to a perfect fit, and the lower half containing the oil compartments, is provided with four drain plugs, facilitating the cleansing of the crankcase of all sediment desposited by the lubricant in service. The timing gears are readily accessible through the removal of a substantial and carefully fitted housing.



Plan View of Chassis of Kelly One-Ton Truck, a Design Making for Simplicity and Accessibility.

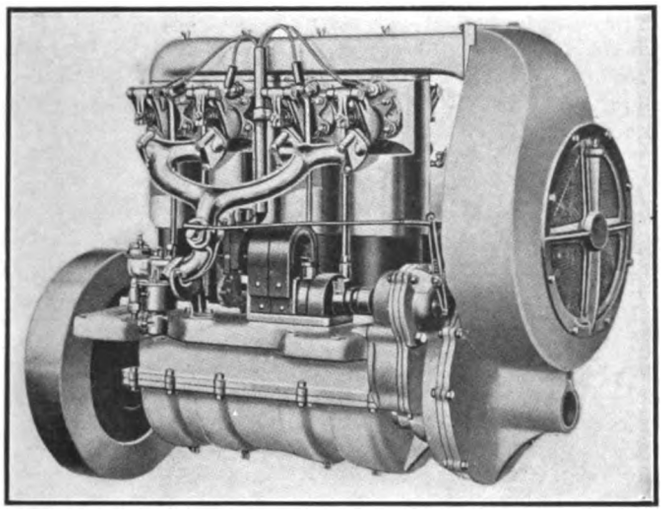
Ignition is by an Eisemann true high-tension magneto which automatically advances or retards the spark according to the speed of the motor, obtaining maximum efficiency at all times. Lubrication of the main bearings is by force feed gear driven oiler located on left hand side of the motor, the other working parts being cared for by the splash system. The oil tank is of ample capacity and provided with means for adjusting the flow of lubricant.

The cylinders are cooled by a centrifugal blower which is integral with the motor. This member is housed and being directly back of the cross member of the frame is protected from possible injury. Air is drawn into the housing by the blower, which operates at crankshaft speed and is actuated by a silent chain. It is then forced at a very high rate through an aluminum pipe extending to and over the cylinders, passing down over these members, thoroughly cooling the exhaust valves as well as other components of the motor. It escapes at the bottom of the jackets, as indicated in the phantom view illustration depicted herein. It is claimed that the fourth cylinder receives exactly the same amount of cooled air as the other members. That portion of the system attached to the cylinders is re-

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moved easily, if desired, being retained by four wing nuts.

The motor is suspended by four substantial extensions of the main frame, and by removing eight bolts the power plant



Diagonal View of the Power Plant, Outlining Construction of Blower and Housing, the Cylinders Being Cooled by Air Forced at Very High Speed.

may be removed easily and quickly. The clutch is a specially designed leather faced cone, provided with springs beneath the frictional material, making for easy engagement, and is operated by the usual pedal. Perfect alignment is secured by a cross shaft and a centre cross member between which is located the gear shifting gate and control levers.

Drive from the clutch is through a double universal joint enclosed in a dustproof housing between the clutch and front end of the torque tube, this arrangement permitting the motor to be cranked easily with the car twisted out of line, as well as facilitating shifting of gears. The propeller shaft is enclosed in a substantial torque tube, the front end of which is supported on the centre cross member of the frame by a yoke and slip joint. The driving shaft is of high grade nickel steel, 1.4375-inch diameter, having squared ends.

The jackshaft is of the semi-floating type and of the built-up design, making removal and replacement an easy matter, as by loosening a lock nut on either side of the differential the shaft can be withdrawn. The driving axles are made of nickel steel, 1.375-inch in diameter, with the differential ends squared. The driving ends are flanged and the sprockets are secured to these flanges by six bolts, obviating keyways or square ends, also making for security. The sprockets on the rear wheels are also of the bolted-on type. Final drive is by side chains these being 1.25-inch pitch with rollers .75-inch diameter and width.

The transmission is what is known as the stacked type; that is, the countershaft is beneath the main shaft instead of beside it, and inspection is by means of a side plate, the latter being equipped with a filler plug at the correct oil level. It is claimed of this arrangement that it is impossible to insert more lubricant than should be used. The transmission is of the selective type, providing three speeds forward and reverse. The shafts and gears are constructed of heat treated steel and rotate on high duty Hyatt bearings. The shafts are 1.1875-inch square and the face of the gears is from one to 1.5 inches. The design of the differential is such that either the top or lower half may be removed and replaced easily. The housing is reinforced by ample webs.

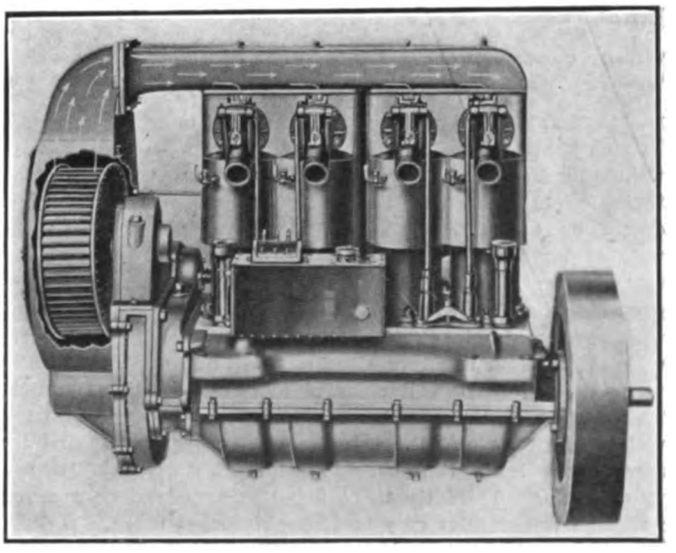
The construction and adjustable features of the radius rod are unique, this being designed to withstand the severe stresses to which these members are subjected when the brakes are located on the rear wheels. The radius rod is made in a single piece, the sprocket end being split and provided with a tongue and groove then bolted together. An adjusting block is fitted inside and on either side is provided with substantial adjusting bolts. With this construction all of the braking strain is taken on a practically solid forging and the adjusting screws are subjected only to compressional stresses.

Particular attention has been paid to the brakes, these being two in number and both located on the rear wheels, the service being operated by pedal and emergency by lever at the right of the driver. The drums are 16 inches in diameter and two inches wide, and it is claimed by the maker that a fully loaded truck may be brought to an instant stop on an 18 per cent. grade with the vehicle moving at a rate of 20 miles an hour.

The frame is of very heavy pressed steel, channel section, with cross members and corners reinforced by gusset plates. In addition to the front cross member is a substantial bumper affording protection to the power plant. Both front and rear axles are of the I beam section type, drop forgings with integral spring seats. The front axle section is 2.875 by two inches and rear, three by two. The spindles are of ample proportions, equipped with large size taper bearings. The adjustable cross rod is located in the rear of the front axle and the reach rod connections are substantial in construction.

Semi-elliptic springs are utilized both front and rear, the former being 40 inches long and 2.25 wide. The rear are 44 inches by 2.5. These are anchored securely to the main frame and equally well fastened to the axle. All parts subject to wear are provided with grease cups, these being readily accessible. The wheels are artillery type of carefully selected hickory, having 12 two-inch spokes, and both front and rear members are 36 inches in diameter, being equipped with solid, single tires 36 by 3.5 front and 36 by four rear. The special equipment provides for demountable pneumatics, these being 38 by 5.5 inches, both front and rear. The wheelbase is 120 inches with 60-inch tread rear and 56 front.

The steering gear is of the irreversible worm and gear type with 18-inch wheel upon which is mounted but one lever, that controlling the carburetor. To prevent overspeeding the motor is equipped with a ball type governor which can be set and sealed for any desired speed. The normal



Phantom Side View of Motor, Showing Course of Air Through Aluminum Pipe and Cylinder Jackets, the Former Being Easily Detached by Means of Four Wing Nuts.

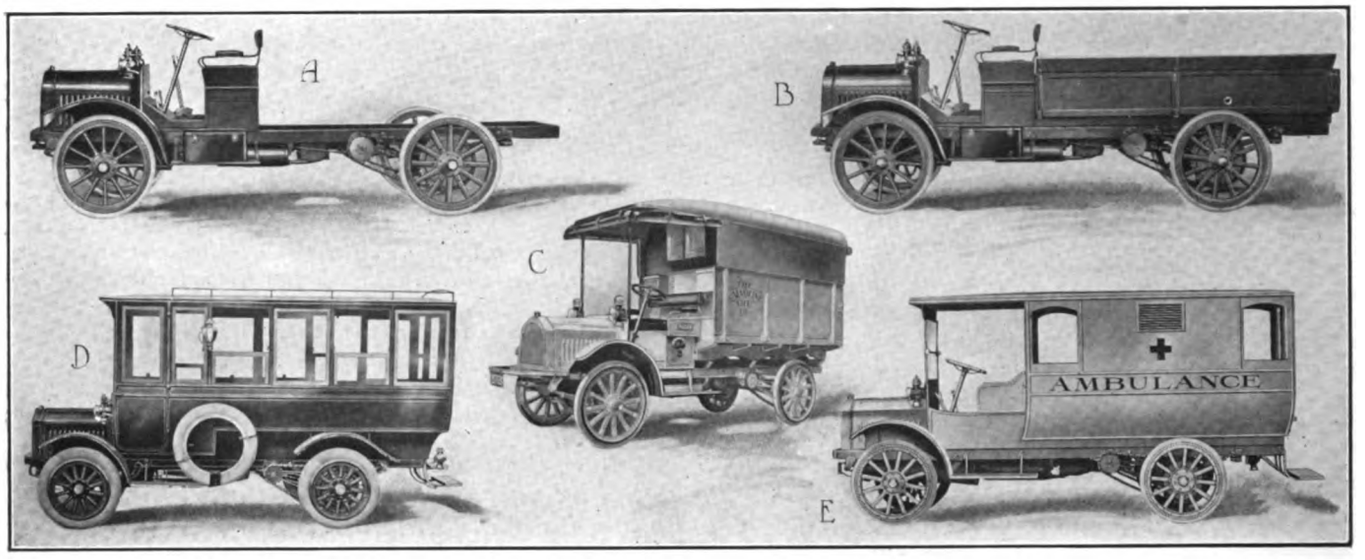
maximum speed recommended by the maker is 15 miles an hour. The fuel tank is located under the driver's seat having a capacity of 20 gallons, and the standard equipment

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includes three oil lamps, horn, kit of tools and jack. Although rated at one-ton the chassis is designed for 1.5 tons capacity and weighs 3500 pounds. Throughout the Kelly Motor Truck Company has adhered to its policy of simplicity and few parts, making for accessibility, inherent features of its product.

A wide variety of bodies is manufactured to meet the requirements of all industries as well as for municipal service, the latter including fire apparatus, ambulance, patrol, etc. An ambulance body designed to fit the chassis described is presented in an accompanying illustration, and is of the panel type laminated wood with interior finished in natural wood and outside in white enamel. Windows are provided directly back of the driver's seat, also in the rear door, and side panels and plate glass side shields add to the attractiveness of the design. The top is solid and the interior specifications include willow wicker stretcher with air mattresses, rubber slip cover, air pillow, medical chest and cane bottom folding seat extending full length of one side of the interior of the body. The body is eight feet 10 inches long inside measurement, 55 wide and five feet one inch high, with rear door opening of 45 inches.

The Kelly depot or 'bus body, also fitted to the one-ton chassis, is another attractive design, accommodating 12 passengers, and the equipment throughout is in keeping with its rich appearance. The seats are built lengthwise of body, upholstered in hand buffed leather and provided with comfortable springs. The lazy-back extends the full length of the body and is trimmed similarly. The interior is in natural wood and entrance is at the rear. The driver is also enclosed, a slideable partition separating him from the passengers. The windows are of the drop pattern fitted with bevel plate glass and equipped with eccentric fasteners, which lock them in any desired position and securely. Pullman type automatic roller curtains are standard equipment. The roof is of the English coach construction, fitted with rail for luggage and the interior of the body is lighted by three dome lights, the electric equipment providing also for pillar lamps. Solid tires are fitted as standard equipment although pneumatics may be had, this being extra.



Kelly One-Ton Truck: A, Side View of Chassis; B, Express Body; C, Type Utilized by Valvoline Oil Company; D, Depot Wagon; E, Ambulance.

BAD TIME FOR CARS IN MEXICO.

The trouble in Mexico has upset the automobiling conditions considerably, for nearly all who had enough money to buy cars long ago left the territory which seems so dangerous, while those who stayed will not invest money in machines which may be confiscated or destroyed by the rebels. Due to the perils of war and the falling off in travel, the 'bus line between Jalisco, on the Pan-American Railway, and Tuztla Gutierrez has been discontinued after two years of successful operation. The line changed a hard three days' horseback trip into a pleasant journey of 12 hours, and the service will be resumed when the country becomes quieter and travel safer.

DISPLACES MULES IN MINES.

Reports have come to the Eastern owners of the Jersey Valley Mines Company, which operates silver and lead mines in Humboldt county, Nev., of the economy which the use of a motor truck is making possible. The truck is employed to carry supplies, bullion, etc., from the mine to the nearest railroad station, some 46 miles away, and makes the round trip of 92 miles in 16.5 hours, carrying 15 tons. The time going out loaded is 9.5 hours, while the return trip is made in seven hours, which is remarkable when the condition of the roads with their heavy grades on the mountain sides is considered.

A 12-mule team was formerly used for the work, and took six days to make the same journey with a six-ton load, of which time three days were used on the loaded trip, one day to rest the mules, and two days for the return. Since the company purchased the truck it has discarded the mules in this field and the machine is used for all work where the roads are passable. It is stated that the truck can often go where mules cannot, on account of the poor water supply. In that country mule drivers worry more about getting water for their mules than good roads, while the truck can carry enough water for long trips and go straight through without detours for water.

ECONOMICAL FOR HARDWARE FIRM.

A Detroit hardware firm that has been using a two ton G. M. C. truck for three months, watching its work closely, states that it is very well pleased with its economy, for it costs 50 per cent. less than the horses formerly used. It does the work of three teams and covers from 20 to 30 miles daily, making from 65 to 100 stops.

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TRUCK STANDARDS ADVISED.

The executive committee of the National Association of Automobile Manufacturers held its regular monthly meeting May 1, when several recommendations made by the commercial vehicle committee were adopted unanimously. The most interesting resolution had to do with the problem of motor truck demonstrations, and read as follows:

Resolved, that the executive committee recommends to all the members of the association that no member of the association shall demonstrate a commercial car or automobile which such member has for sale, to a prospective purchaser or customer, unless such member makes a charge and receives in payment for such demonstration the following prices only, to wit: One-half and one-ton trucks, $10 a day; two-ton, $15; three-ton, $20; four-ton, $25; five and six-ton, $30; seven and eight-ton, $35; nine and 10-ton, $40.

Another resolution adopted dealt with the width of the frame back of the seat, and was proposed with a view to providing for future interchangeability of bodies on trucks of different makes. Two standard widths of frame back of the driver's seat were adopted—36 and 42 inches—with frame lengths back of seat as follows: Feet—four, five, six, seven, eight, nine, 9.5, 10, 10.5, 11, 11.5, 12, 12.5, 13, 14, 15, 16, 17 and 18. These frame dimensions, if generally adhered to, will permit of stock bodies being built in quantity and delivered without delay, with the assurance that they will fit any make of truck.

The question of the threatened legislation increasing the license fees of motor trucks according to horsepower instead of load capacity, was considered, and a resolution was passed directing counsel to prepare a registration bill in which the fees shall be based on the factory rated load capacities at the rate of $5 for trucks of one ton capacity with an increase of $2.50 a ton for capacities above that up to $10 for trucks of over 10 tons capacity. The bill is to be introduced in the Massachusetts and New York legislatures, and it is hoped will be enacted and serve as a model for other states.

The committee is to confer with the Society of Automobile Engineers with the idea of agreeing upon the lines along which each organization shall proceed in recommending standards, in order to prevent duplication of effort. The feeling is that the N. A. A. M. has as its field the standardization of matters directly affecting the sale, use and guarantee of trucks, while the S. A. E. has as its sphere the bringing about of uniformity of engineering practise in the design and construction of the chassis, covering also the rated load capacity.

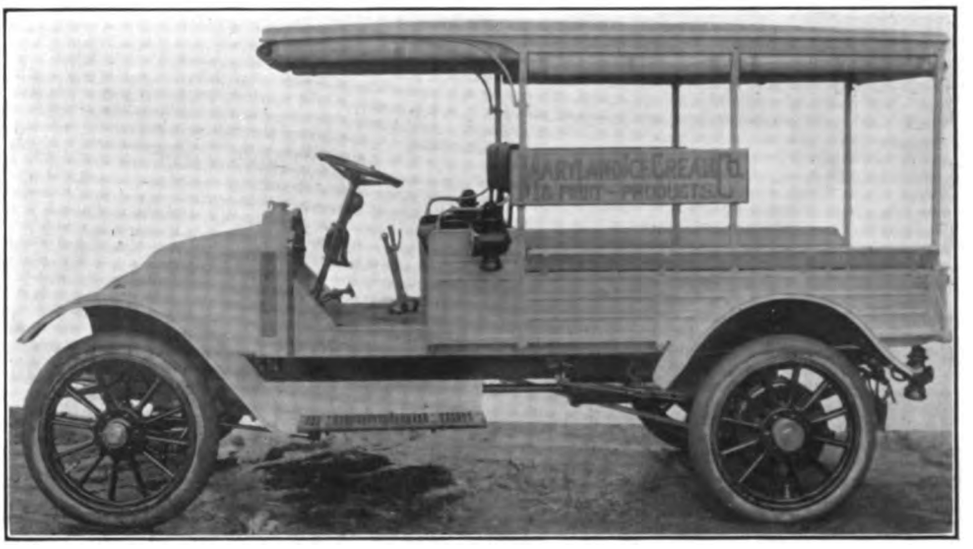
The subject of frame heights is being considered, and it is expected that heights will be prescribed which will bear a relation to the heights of freight car floors and express and transfer platforms, in order to facilitate loading and unloading. Statistics of the production and sale of motor trucks during the last year are being gathered, and it is expected will be complete in about a month.

NEW STORAGE BATTERY.

Announcement comes from Chicago that Carl E. Winters of that city has produced a new storage battery which is much superior to former types. It is claimed that the new device will afford 350 cycles of charge and discharge as against 75 to 125 of the old batteries; that the plates are absolutely non-sulphating, with active material that will increase 35 per cent. in efficiency, maintaining this high state during a period of three years. It is claimed that there is no internal discharge or chemical action when the batteries are not in use, and that the terminals are non-corrosive. The Perfection Storage Battery & Lighting Company has been formed for the manufacture of the battery, and a large output is planned.

LIGHT VEHICLE MORE ECONOMICAL.

The Fuhrman & Schmidt Brewery Company, Shamokin, Penn., some time ago tested two trucks, one with a capacity of one ton, and a larger machine of seven tons capacity, with the idea of trying out the two in order to see which would be the more economical. The test revealed that for the brewery the difference in relative cost was very marked while both did about the same amount of work. The small truck was handled by one man unassisted, who did all the loading and unloading, carrying 14 half-barrels to a load and making 14 trips in seven hours. The larger truck required the services of two men all the time, with another to assist in loading and unloading. It made three trips in the same time that the small machine was making 14, and carried only one more barrel in the seven hours than the light weight. Besides needing two more men than the small truck, the seven-ton machine cost more to operate, the gasoline and oil bill being greater, with tire wear, depreciation, and interest on investment also amounting to a larger figure, so that for this particular firm the smaller truck was the more economical.



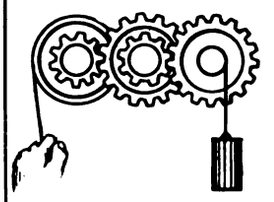
Lippard-Stewart Truck with Express Body Built Especially for a Baltimore Ice Cream Company.

LIPPARD-STEWART FOR ICE CREAM.

The Lippard-Stewart Motor Car Company, Buffalo, N. Y., has sold a number of its delivery wagons recently to ice cream companies. The latest purchase by a firm of this character was by the Hoefler Ice Cream Company of Buffalo, which bought five enclosed panel body wagons for its retail delivery system. The Maryland Ice Cream & Fruit Products Company of Baltimore, Md., is another recent customer, having purchased a finely finished express body which was built especially for the firm. It is painted in cream and brown, making a decidedly neat appearance.

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RECENT MOTOR VEHICLE PATENTS



Domizi Piston Ring Chuck.

A chuck for piston rings has been patented by David F. Domizi, Franklin, Penn., consisting of a body adapted to be attached to the live spindle of a machine tool, and having a clamping face perpendicular to the axis of said spindle, also means for centring the ring and for securing same. The device also consists of a longitudinally movable clamping rod having a head comprising laterally projecting lugs, and a clamping plate adapted to be engaged by said rod head.

Lewis Muffler.

The elimination of noise and back pressure is a desiable feature in a muffler and numerous designs are presented by the inventors. Edward Dudley Lewis, Elmira, N. Y., has patented a muffler comprising six semi-globular inter-communicating hollow sections, each containing a vertical baffle plate member, so designed as to deflect the gases through openings therein. The partition plates and hollow

Bowen Grease Cup.

It has become standard practise to fit grease cups to all components of the chassis not lubricated by the oiling system. These cups are more or less exposed to dirt which clogs their threads making it difficult to turn down the members. George W. Bowen of Auburn, N. Y., has been granted a patent for a grease cup which presents many practical features, inasmuch as the working parts are protected from foreign elements. The device is similar in shape to the usual members, but is fitted with a rotating, vertical threaded plunger which actuates a disc, and the latter in descending forces the lubricant to the working parts.

Berliner Speed Alarm.

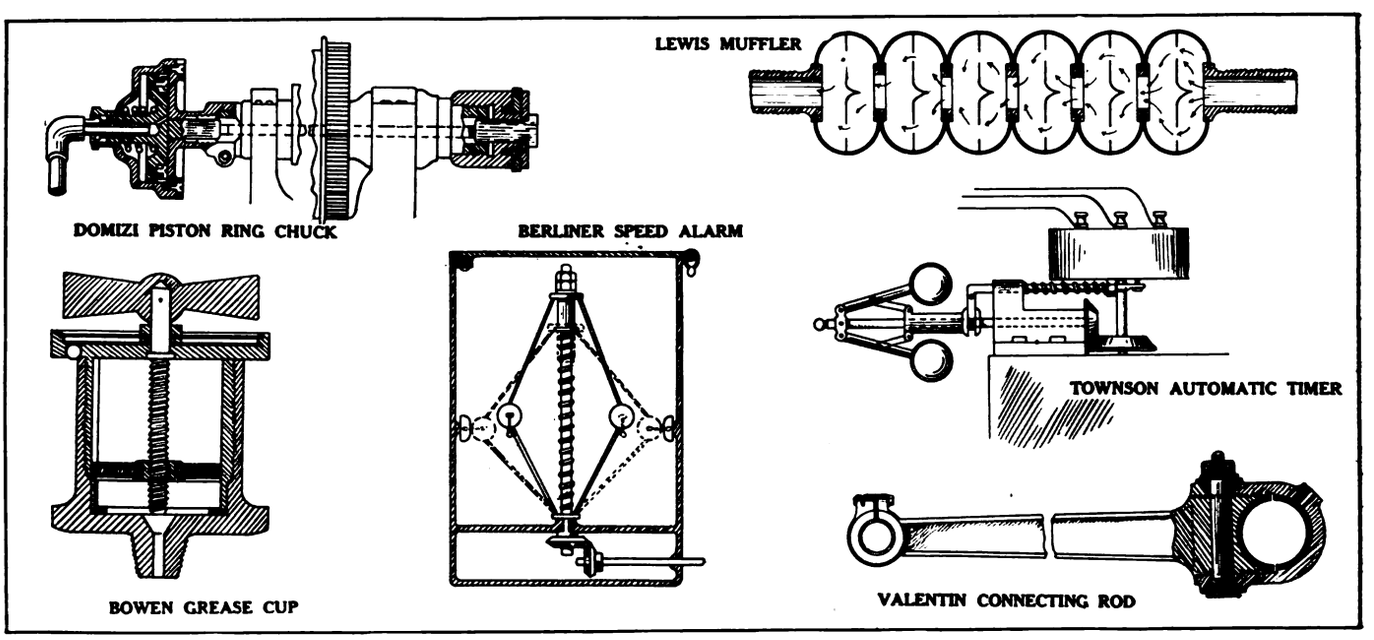
The overspeeding of commercial vehicles is one of the evils which the owner and maker is seeking to overcome. A device which rings a bell when a predetermined speed is reached, has been patented by Rudolph Berliner, Daniel Swem and Henry F. Moore, Chicago. It is on the centrifugal governor principle, a pair of arms carrying balls which come in contact with bells when the vehicle attains a certain speed. The device is gear driven from the power plant.

Townson Automatic Timer.

To secure the greatest efficiency from an internal combustion motor utilizing a variable ignition system the advance or retard of the spark must be varied according to conditions, the proper operation being acquired by experience. Thomas Townson, Philadelphia, has patented a device which is claimed to control automatically the time spark by actuating the timer or distributor in proportion to the speed of the motor. It consists of a shaft gear driven from the time shaft of the engine and supported by a bracket. The first named shaft is fitted with a movable sleeve to which is attached two weighted pivotally mounted arms. These revolve with the shaft and as the speed of the motor increases the ball members actuate the sleeve which in turn moves the timer, advancing the spark. A decrease of engine speed is provided for similarly.

Valentine Bearing Adjuster.

Robert D. Valentine and Henry S. Battee, Minneapolis, Minn., assignors to the Imperial Machinery Company of that city, have been granted a patent for a bearing adjusting device for connecting rods of internal combustion motors. It is a bearing with separately movable members, one embracing the other, a rotating eccentric bolt extending through both and a gib having freedom for lateral movement interposed between the bolt and one of the members. Eccentric cones are fitted to the bolt, and these engage with sockets of one of the movable members. Means are provided for rotating and locking the bolt, the former movement actuating the movable member for adjustment of the bearing.



Depicting Some of the Latest Ideas of Inventors of Devices Applicable to the Commercial Vehicle.

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FIRE DEPARTMENT NOTES

AMERICAN-LaFRANCE PUMPING ENGINE.

Presented herewith is the new six-cylinder combination pumping engine, chemical engine and hose wagon, manufactured by the American-LaFrance Fire Engine Company, Elmira, N. Y. The equipment includes everything necessary for the average fire department. The pumping engine, which is operated by the same motor as that which propels the vehicle, is capable of throwing 700 gallons of water a minute. The 40-gallon chemical tank supplies 200 feet of chemical hose, and the body is arranged so as to carry this and 1200 feet of 2.5-inch regular fire hose in addition.

The car is built entirely in the shops of the company, and is designed and constructed especially for heavy service. Particular attention has been paid to matters of refinement and simplicity essential in producing a successful chassis, capable of withstanding the severe stresses of hard work. The material and labor entering into the assembly are of the finest, and in its mechanical features the machine combines the best points known to motor car builders, and is held to anticipate future developments.

The motor is a six-cylinder, four-cycle, water-cooled unit, with 5.5-inch bore and six-inch stroke, developing 72.6 horsepower under the S. A. E. rating. However, as this formula assumes a piston travel of 1000 feet a minute, it is claimed that it is possible for the motor to develop an actual horsepower of 95 under brake test.

Cylinders are cast in pairs of the very finest specially selected gray iron, with offset inlet and exhaust valves on opposite sides. They are bored and ground, as are the pistons and rings, insuring perfect compression. The water passages are integral with the cylinder casting and are liberal in size, being so designed that the cooling water is taken on the exhaust side and discharged from the top over the combustion chamber. The water jacket covers on top of the cylinders provide a large space and form an outlet to the radiator.

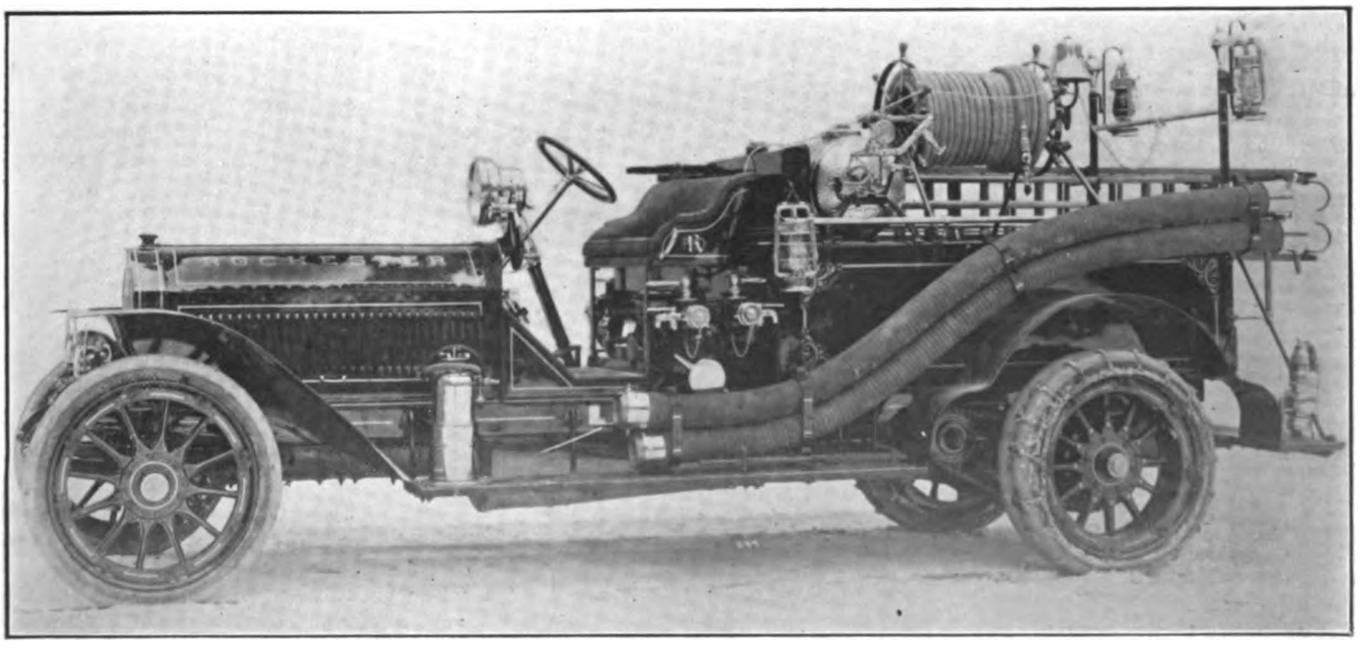
The crankcase is an aluminum casting, made entirely as a unit and provided with numerous ribs, giving added strength without excess weight. It is designed to rest directly upon and be bolted to the main frame, doing away entirely with sub-frames. This casting is machined throughout from templates and jigs, giving perfect alignment and interchangeability. The bottom half, or oil pan, may readily be removed for inspection of the main bearings and connecting rods, and is arranged with semi-circular channels to catch any dirt or foreign matter. Each channel is provided with a drain plug, for the withdrawal of old lubricant. An oil tight extension of the crankcase forms a housing for the timing gears, this arrangement giving quiet running, good lubrication and very little wear.

The cast iron pistons are machined and ground to gauge, and grooved to take four cast iron piston rings. These latter are ground to the diameter of the cylinder bore and to the width of the grooves. The piston pins are of hollow steel, hardened and ground, and are held in place by a locking belt. The length of the piston pin bearings is 2.5 inches and the diameter 1.25 inches.

The crankshaft is machined from a solid billet of nickel steel, heat treated, and all bearings are accurately ground to size. The crankshaft and connecting rod bearings are of special bearing metal, and are large in size to afford ample bearing surface. These are four in number, those at the front and rear being four inches in length and those in the centre 3.25. All bearings are provided with oil grooves, insuring constant lubrication. All dimensions of this shaft, except bearings, are required to check within .001 inch, over or under; bearings to be round and true to size within one-quarter of that allowance.

Connecting rods of drop forged I section, special heat treated steel, are machined in jigs and fixtures. The cap is drop forged integral with the rod. The ends are drilled, reamed in jigs and the cap then milled from the connecting rod in a special fixture, which provides for absolute interchangeability. Shims are used in drawing up the cap to a perfect bearing.

The valves have cast iron heads welded to steel stems. They are turned and accurately ground to the same size,



Six-Cylinder Combination Pumping Engine, Chemical Engine and Hose Wagon, Produced by the American-LaFrance Fire Engine Company, Elmira, N. Y.

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and lapped into taper valve seats. The lifter guides are die cast of babbitt metal and the lifters are of steel, turned, hardened and ground. The design of the valve lifters allows provision for adjustment by means of a set screw with a lock nut. They are made in two pieces, the top half being held against the lower end of the valve stem by a spring.

The latter is machined from the solid bar with integral cams, hardened and ground to absolute accuracy. The timing gears are drop forged of special steel, have a face width of 1.5 inches, and the teeth are of a fine pitch. The gears driving the magneto and water pump are located on opposite sides of the motor, meshing with the timing gears. These are carried on like shafts, supported on two widely spaced annular ball bearings. All gears are enclosed in an oil tight extension of the crankcase.

For powerful motors running under high compression, a compression relief is held to be necessary for starting. This is accomplished by shifting the exhaust camshaft slightly forward, and bringing into contact with the exhaust valve lifters a toe ground integral with the camshaft, which lifts each valve during the compression period of its respective cylinder, thus opening the valve and allowing some of the mixture to escape. The shifting is done by a lever, and after the motor is started the compression may be thrown in again immediately.



Interior of White Combination Car, Showing Arrangement of Seats, Hose Compartments, Etc.

The carburetor is of the float feed type, with automatic auxiliary air intake, water jacketed. The gasoline tank has a capacity of 28 gallons, and is located underneath the body at the rear of the chassis. Ignition is by Bosch high-tension magneto dual system.

Two oil tanks, each of one gallon capacity, are located between the cylinders and supply a mechanical oiler, with sight feeds and feed regulator mounted on the dash. The lubrication system is a combination of the gear driven pump and constant level splash. The radiator is mounted on the main frame by a ball and trunnion support. An aluminum fan, driven by belt arranged with belt tightener, is mounted on annular ball bearings at the forward end of the cylinders just back of the radiator. Another fan is located in the motor flywheel.

The clutch is of the multiple disc type, entirely enclosed and running in oil. It consists of 21 bronze and steel, wedge shaped, circumferentially grooved plates, 11 inches in diameter. Between the clutch and transmission driving shaft is a shaft made of chrome nickel steel, arranged with universal joints.

The transmission is of the selective sliding gear type, affording three speeds forward and reverse, direct drive on the high. The range is from one to 50 miles an hour. The gears, shafts and pinions are all made of chrome nickel steel, case hardened, and the shafts are mounted on F. & S. annular ball bearings. The sliding gears are broached and have a sliding fit on the bevel gear driving shaft, which is splined in a thread milling machine, hardened and ground. An interlock is provided for the shifting rods which makes it impossible to move one sliding gear when the other is not in a neutral position.

The transmission case is cast in a single piece, housing both the transmission and differential. The jackshafts are squared to take the differential bevels and are supported on F. & S. ball bearings. Final drive is by double side chains.

Two sets of brakes are provided, both acting on the rear wheel hubs. Springs are semi-elliptic front and rear. Wheels are of the artillery type, fitted with 38 by 4.5-inch cushion tires, single in front and dual in rear. The axles are drop forged I section, Krupp chrome nickel steel, with no welds, specially designed for service. Timken roller bearings are employed in all wheels. The side and cross frame members are of chrome nickel steel. The wheelbase is 156.75 inches, the tread 62 in front and 70.75 in rear.

WHITE FIRE WAGON SUCCESSFUL.

Accompanying illustrations present two views of the combination chemical engine and hose wagon delivered by the White Company, Cleveland, O., to the Young America Hose Company of Poughkeepsie, N. Y., in November, 1911. The equipment is fitted to a regulation White chassis and includes everything required for the proper fighting of fires, the main idea being to stop the blaze before it has reached definite proportions. The Poughkeepsie company answers every alarm in the city, and writes that it has never experienced any trouble whatsoever.

In every respect the machine has surpassed all sections of the guarantee given by the White Company when it was purchased. It climbs the hills of the city with ease, and as for speed, it has developed as high as 55 miles an hour on the long runs into the suburbs. Although some of the streets in these outlying districts were in decidedly poor condition, the mud often being hub deep during the spring months, the White fire wagon travelled over them easily.

The item of expense always is of interest, and President Lewis A. Thomson of the Young America Hose Company says the total cost of maintenance for the first five months was exactly $1.49.

WEBB WORKS LONG HOURS.

The Webb Motor Fire Apparatus Company, St. Louis, Mo., claims a record for one of its Webb motor pumping engines, which recently worked continuously in Akron, O., for 91.5 hours. The water was lifted from 12 to 16 feet, and it is estimated that the pump delivered a stream averaging 500 gallons a minute throughout the entire period. The fouling of two spark plugs was the only apparent wear upon the apparatus, and even this was not discovered until the service was completed and the engine was subjected to a minute inspection at headquarters. With one exception, the longest run accomplished by a steam fire engine was 123 hours, this exception being the flooding of the coal docks at Superior, Wis., in which the engine worked 240

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hours. In the case of the steam engine pure water was supplied, while with the Webb, the pumping was with city sewage.

MOTORS FOR COLUMBUS, OHIO.

After considering the matter from every viewpoint the city council of Columbus, O., has decided to adopt the recommendation of Chief Lauer for the complete motorization of the department. Chief Lauer conducted a systematic campaign for his proposition, making several speeches before the council, calling particular attention to the increase of territory occasioned by recent annexation and the necessity for more adequate fire protection. He maintained that the utilization of motor equipment would prove not only the best but the cheapest, all things being considered. An ordinance has been passed, authorizing a bond issue of $50,000 with which to make the required purchases.

BIG REDUCTION IN FIRE LOSS.

Manufacturers of motor driven fire apparatus are prone to lose sight of one feature, which proves an excellent selling argument with city officials who are considering the advisability of replacing horses in this work. The factors of economy in maintenance and operation, as well as the saving in land and buildings devoted to fire service, are important, but there is still another view of the matter, as indicated by the following statement of conditions in Tacoma, Wash.:

The fire loss in that city during 1911 was $151,000, as compared with $496,000 in 1910. Those interested in the modern motor equipment installed in Tacoma, claim that the decrease is almost entirely due to the use of the automobile. The department now has nine machines, which enable the firemen to reach the scene of a fire much quicker than with horses, thereby making it possible to begin fighting the blaze before it has had time to become serious.

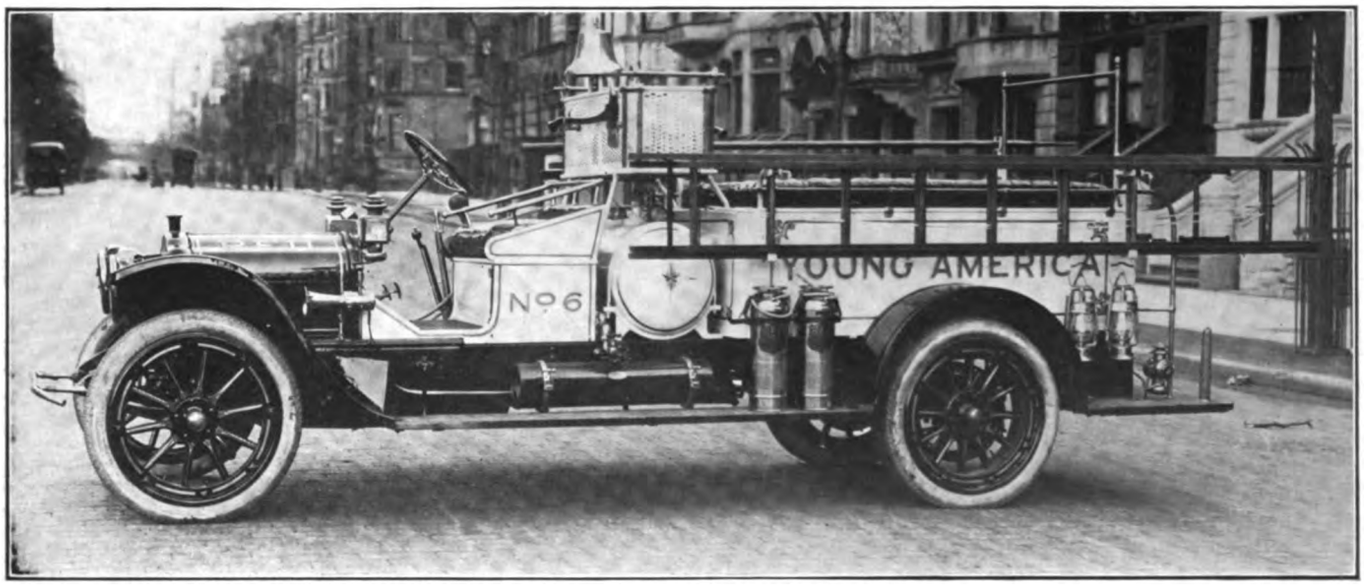
SEVERE TEST FOR AHRENS-FOX.

Rockford, Ill., is decidedly enthusiastic concerning the Ahrens-Fox pumping engine delivered to it by the Ahrens-Fox Fire Engine Company, Cincinnati, O., last January. Soon after it was placed in service, it was called upon to fight a serious blaze in the plant of the Rockford Desk Company, where it pumped water for 17 hours, a greater portion of the time with the thermometer registering 10 below zero.

As a further indication of the possibilities of the engine, a recent official test showed that it was capable of throwing 760 gallons of water a minute at a pressure of 104 pounds through two lines of hose fitted with 1.125-inch nozzle. Eight hundred and thirty gallons a minute were pumped at a pressure of 83 pounds with a 1.25-inch nozzle. With a 1.375-inch nozzle the pressure was 130 pounds and the amount 635 gallons; with a 1.5-inch nozzle, 115 pounds and 705 gallons; with 1.75-inch, 79 pounds and 800 gallons, and with two-inch, 55 pounds and 880 gallons.

SPECIAL INSTRUCTION CHASSIS.

The fire department in Lynn, Mass., has been making such rapid strides in the matter of securing automobile equipment, that it is a foregone conclusion that all of the apparatus will be propelled by motor within a short time. Taking this situation into consideration Chief Thomas A. Harris has purchased of the Thomas Motor Car Company of Boston a special chassis, which will be utilized by members of the department in learning how to operate and keep in repair the various machines placed at their disposal. In addition to its usefulness as a vehicle for instruction, a body will be fitted suitable for carrying coal to the various fire stations, etc.



Combination Chemical and Hose Wagon Installed on White Chassis, in Service with Young America Hose Company, Poughkeepsie, N. Y.

IN THE MARKET.

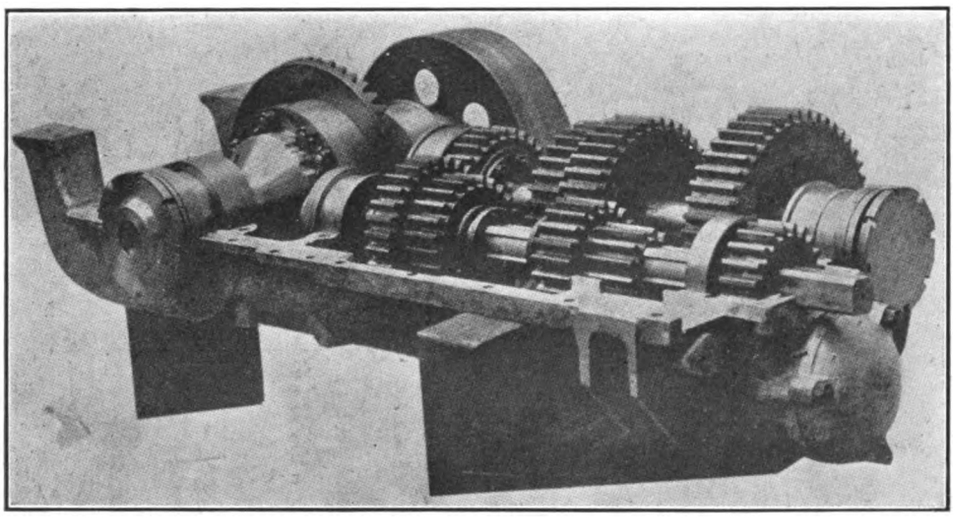
The following cities and towns are interested in the purchase of motor fire equipment: San Jose, Cal., bids are asked; Stoughton, Mass., money being raised; Winchester, Mass., combination hose and chemical; Newark, N. J., appropriation of $27,000; Albany, N. Y., underwriters recommend three combination vehicles and cars for chiefs; Buffalo, will equip new house; Braintree, Mass., pumping engine; Temple, Tex., two pieces; Des Moines, Ia., possible bond issue of $75,000; Pasadena, Cal., would replace horses; Hamden, Conn., combination hose and chemical; Racine, Wis., two or three pieces; Auburn, N. Y., apparatus not in excess of $22,000; Waverly, N. Y., chief recommends motor equipment.

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FOREIGN TRUCK NOTES OF INTEREST

THE FOUR-TON HALLFORD.

Accessibility and ease of adjustment, combined with extreme simplicity and low maintenance cost, are the important factors entering into the design of the Hallford vehicles, manufactured by J. & E. Hall, Ltd., Dartford, Kent, England, and shown herewith in the four-ton size. This concern was established in 1785, and has a reputation in engineering work which is well known throughout the British empire. It has been engaged in the manufacture of commercial motor vehicles for a number of years, and points with pardonable pride to the fact that in the Royal Automobile Club's trials of September and October, 1907, in which nearly 60 cars of all classes competed, its product received higher awards than any other competitor in any class.



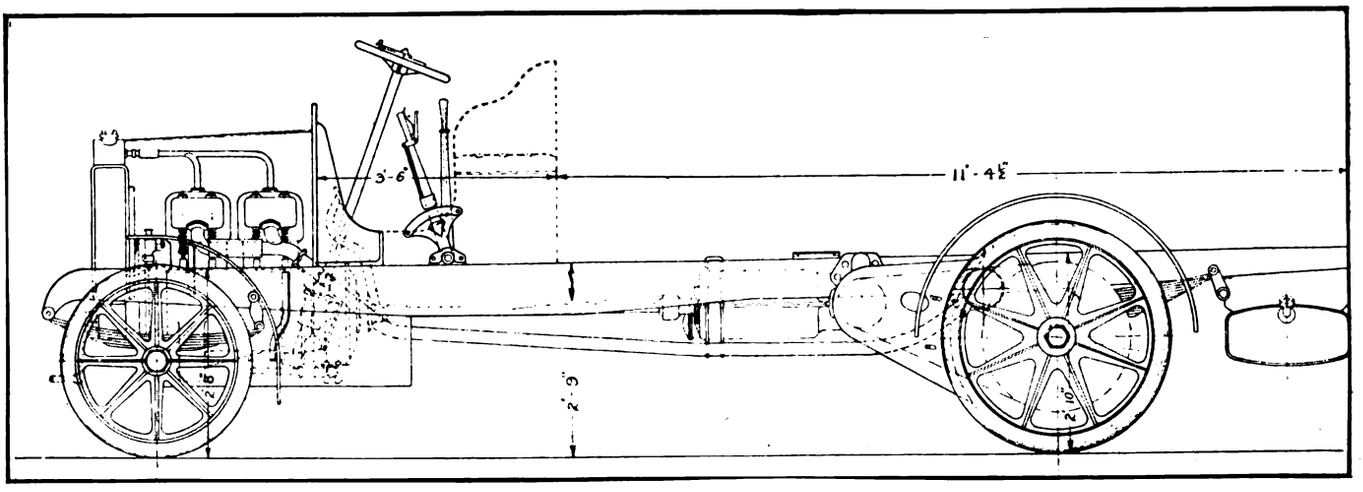
Sliding Transmission Employed in Four-Ton Hallford Truck of English Design.

Every part of the chassis is made strictly on the firm's interchangeable jig system, making for beneficial results whenever it is found necessary to order spare parts or renewals. All parts are made in the company's own works including the motor, gears, radiator, etc., insuring an absolute guarantee with respect to both materials and workmanship, and particular stress is laid upon the fact that in the design and construction throughout, efficiency has been considered as of greater importance than first cost.

The motor is a four-cylinder unit, rated at 32 horsepower under the R. A. C. formula, and the extreme simplicity and accessibility of the various parts are clearly demonstrated in the accompanying illustration. The carburetor, for instance, is detached by merely loosening the nuts on the top flanges. The high-tension Bosch magneto is held in position by a brass strap and wing nut, and it is claimed that replacement and renewal can be accomplished in one minute's time. The timing gear, oil bypass, oil filler, etc., also are so placed as to be accessible immediately when adjustment or cleaning is necessary.

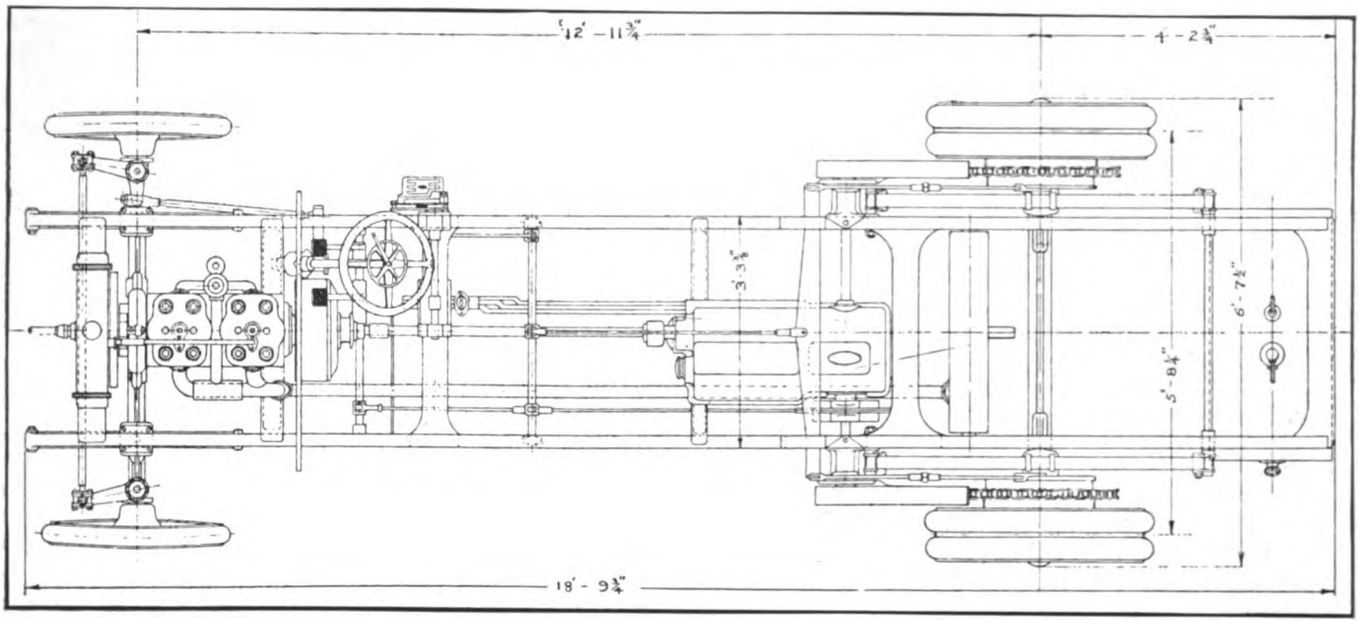
The crankcase is of aluminum. Inlet and exhaust valves are made from nickel steel, and are strictly interchangeable. Timing gears are entirely enclosed in the oil chamber, the lubrication system being the constant level splash. Ample provision is made for cooling, the system comprising a large radiator and fan, the circulation of water being maintained by pump. What is claimed as an exclusive feature with the radiator is the provision for the removal of the side tanks, exposing the tubes and rendering them absolutely accessible for cleaning. This is held to be particularly necessary where hard water is used constantly, and the maker has found it advisable to take this situation into consideration. The hood lifts from the front, exposing all parts of the engine to view for repair or adjustment.

The clutch is of special design, a leather faced cone member, giving ample surface. The transmission is of the sliding gear type, affording three or four speeds forward, according to the desires of the purchaser, and reverse. Control is by one lever on the gate principle. The gears are of nickel steel, of high tensile strength, and the design of



Side Elevation of Hallford Four-Ton Chassis, Indicating Principal Dimensions and Arrangement of Components.

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Plan View of Hallford Four-Ton Chassis, Showing Extreme Simplicity of Design and the Effort to Bring About Accessibility.

the teeth is held to be such that they slide into and out of mesh with the greatest ease. All shafts are carried on ball bearings, and double thrust bearings are fitted in three places. All gears are run under load for 12 hours before being assembled in the chassis, to insure quiet and smooth running. The speeds permitted are from three to 18 miles an hour, according to the special requirements of the customer. Final drive is by side chain.

Two sets of brakes are fitted, the first acting on a drum on the gear shaft, the second operating on inside drums in the hubs of the rear road wheels. The frame is of special Hallford design, of pressed nickel steel. Springs are long and of great resiliency. Control levers are of mild steel forged from the solid, all joints being protected from dust. Both axles are of Kirkstall 40-ton steel, and the wheels are cast steel throughout, running on ball or roller bearings. The principal dimensions of the chassis are shown on the accompanying sketches.

The maker of the Hallford vehicles pays particular attention to the matter of body requirements, fitting those especially designed for all types of work. Among what may be regarded as standard bodies are the plain platform, stake platform with chains, lumber, contractor, brewery and high sided express. Several machines with special equipment have been shipped to the various British colonies and other foreign countries, where they have given uniform satisfaction under all conditions.

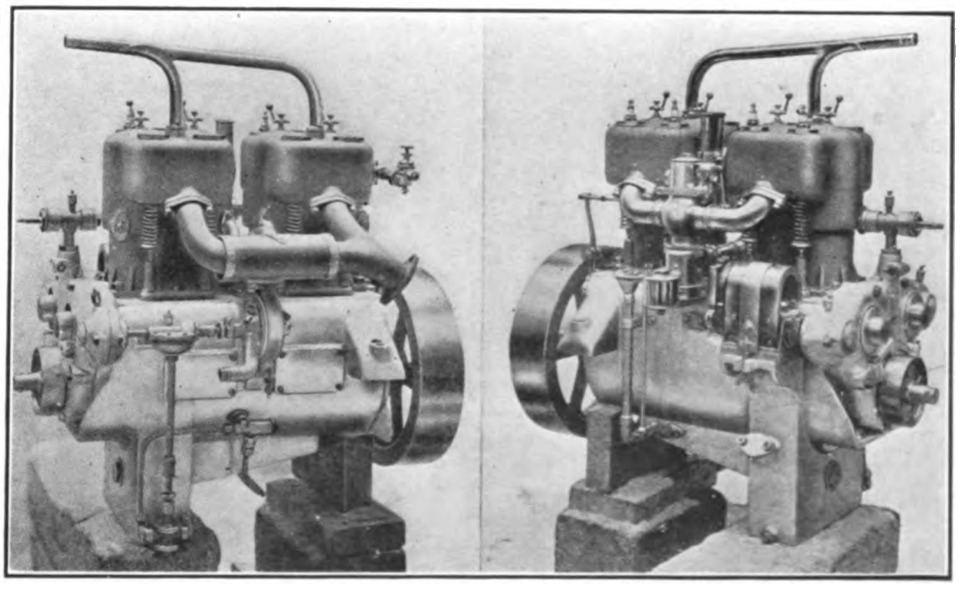
Inasmuch as this concern has been engaged in the production of commercial motor vehicles for many years and has had abundant opportunity to learn the comparative costs between the operation of horses and Hallford trucks, it will prove of interest to examine some of the results obtained. The accompanying tables of the annual cost of conveying goods a distance of 20 miles daily is based upon the assumption that it would take eight horses to do the work of one four-ton truck, which is borne out by the experience of concerns utilizing Hallford vehicles. The comparative figures, with totals carried out in American money, follow:

Annual Cost with Horses.

Four teamsters at 28s a week, 50 weeks	$1362.62
Food and bedding for eight horses at £40 a year	1557.28
Shoeing at £3 a year	116.80
Veterinary at £1 10s a horse	58.40
Rent account, 7s 6d a week	379.58
Depreciation, 15% on equipment, £640	467.18
Maintenance, 10% on wagons, £50	97.33
Interest, 5% on £640	155.73
Total for horses	$4194.92

Annual Cost of Four-Ton Truck.

Driver at 35s a week, 50 weeks	$425.82
Gasoline at 9d a gallon, seven miles to gallon	312.95
Lubricants	44.60
Tire depreciation at 2d a mile	486.65
Depreciation on chassis, 15%	425.82
Maintenance at £75 a year	365.00
Insurance at £15 a year	73.00
Total for truck	$2133.84
Balance in favor of truck	$2061.08



Both Sides of the Hallford 32 Horsepower Motor, Presenting Location of Fittings.

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BELSIZE IN MAIL SERVICE.

The long anticipated motor mail service between Manchester and Birmingham in England has been inaugurated with three Belsize cars, made by the Belsize Motors, Ltd., Clayton, Manchester. The postoffice authorities have entered into a three years' contract with the Auto Van Maintenance Company of Manchester, to run this road service, and figures have been obtained which prove conclusively that it will be far more economical than the older methods employed heretofore.

The type of vehicle utilized is shown herewith, this being the regular 28 horsepower, four-cylinder, three-ton chassis, fitted with a handsome and commodious red mail van body. Entrance to the rear is by means of a flight of steps, which automatically folds up when the doors are closed. These latter are locked and unlocked either from the inside or outside, as occasion demands. Inside the van is a guard's folding seat and hooks for mail bags, racks, and all conveniences for handling the mail en route. Twin Pollack solid tires are fitted to the rear wheels and single in front. The motor is located in front under a hood.



Two of the Belsize Motor Vans Recently Placed in Service for Mail Delivery between Manchester and Birmingham, Eng.

The vehicles will run twice a day between Manchester and Birmingham, by way of Stockport, Macclesfield, Congleton and Stafford, and meet and pass each other between Stone and Stafford. Eight and one-half hours is allowed for the distance on each journey.

BERLIN 'BUSES PAY WELL.

The Berlin General Omnibus Company, Berlin, Germany, reports an annual dividend of seven per cent. on the results for 1911, as compared with six per cent. the previous year. In their report the directors stated that the increase was due largely to the extension of the service so as to include a decidedly additional traffic.

WEATHER AIDS IN SOUTH AFRICA.

In view of the fact that the farmers and business men in South Africa have shown a disposition to purchase commercial motor vehicles in large numbers, it is interesting to note that the condition of the weather has been such for some time past that the trek oxen are dying by the thousands along the coast. The present demand is largely for trucks of four and five tons capacity, which must be constructed for travel over rough roads.

WANT FIRE APPARATUS IN BRAZIL.

The minister of justice and home affairs in Rio de Janeiro, Brazil, is interested in the purchase of a motor fire engine and other equipment of the same nature. It would appear that American manufacturers have an excellent opportunity to fill this order, particularly as other vehicles made here have been doing good service in that country.

GERMAN FARMERS AIDED.

In order to provide more suitable facilities for the farmers of Germany to deliver their produce to market, a motor line is to be established between Heidenheim and Geislingen, Wurtemberg. This will cover a distance of some 20 miles, serving no less than 10 villages. A similar service was inaugurated between Weinheim and Trosel in February, 1911, but as yet has been operating at a loss. The promoters have asked the governments of Hesse and Baden for pecuniary support. It is understood that the vehicles utilized on this line were heavily overloaded during the busy season, necessitating a large bill for repairs.

SUBVENTION AWARDS ANNOUNCED.

The German war office has awarded subvention placques to 120 vehicles as follows: Daimler-Marienfelde, 16; Bussing, 16; N. A. G., 16; Benz-Gaggenau, 16; Durkoop, nine; Eisenach Motor Works, nine; Nanag, nine; Mulag, nine; Nacke, five; Ehrhardt, five; Podeus, five; German Industrial Works, five.

STREET CLEANING IN PARIS.

After making exhaustive tests of the vehicles available for the purpose the city of Paris has ordered 46 motor sweepers from the makers of Renault and Laffly machines, and nine water wagons from the producers of Laffly and De Dion-Bouton cars. In the combined sweeper and sprink-

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ler class no machine was found entirely satisfactory and no orders will be placed as a result. The test machines were all purchased outright and will remain in service, in addition to the fleet mentioned.

IN RICE FIELDS OF SIAM.

Dr. H. Adamson of Siam is credited with being the pioneer in the use of motors in the cultivation of rice, and he reports that the machines not only enabled him to sow the crop much earlier and reap it before the grain of the native grower was ripe, but at a cost approximately half that of the older methods in vogue.

LONDON'S ANNUAL PARADE.

The sixth annual parade of motor trucks in London, England, was held May 27, no less than 308 machines being entered. As has been true in the past this event was patronized by King George V, and was under the auspices of the Commercial Motor Users' Association.

PIERCE-ARROW IN HONOLULU.

What is said to be the first motor truck in Honolulu, Hawaii, is the Pierce-Arrow five-ton worm driven machine recently purchased by the Oahu Ice & Electric Company to haul ice. The body, designed by the Pierce-Arrow factory, has several unique features. The floor and the sides to a height of 24 inches are covered with heavy zinc plate, thus forming a tank to catch the water from the melting ice and preventing it from dripping down onto the chassis. The tank is drained at the front, and the zinc plates are protected from injury by the heavy ice by means of wooden gratings. While the weather in Hawaii is supposed to consist of pleasant sunshine, provision has been made in the truck for an occasional rain storm or hot spell, the top extending over the rear and protecting the men while at work weighing the ice. The body is large enough to hold 36 cakes of ice of standard size.



Pierce-Arrow Worm Driven Truck Purchased by a Honolulu Ice Company.

NEW MARKET IN SOUTHERN AUSTRALIA.

The Victorian Storekeepers' Association of Melbourne, Australia, is decidedly interested in the subject of the mechanical transport, and has before it a proposition to purchase a number of vehicles for the transportation and delivery of merchandise. This organization is supported by the country trade, and all important firms in the state are connected with it. The secretary, George Jones, Melbourne, is anxious to receive catalogues, trade information and any printed matter descriptive of machines suitable for service in that commonwealth. It may be well to add that there is a distinct demand for cars capable of transferring goods long distances to branch offices.

FIRE WAGONS IN SINGAPORE.

The municipality of Singapore, in the Malay peninsular, has ordered its fifth motor fire vehicle, and is claimed to be the first city in the Far East to have a fire department, completely motor equipped. The new car is fitted with a 55 horsepower engine and steel wheels. This latter innovation is said to have been the result of a distinct problem which has arisen with the use of wood. The humidity of the atmosphere is held to be the cause of the trouble and it is stated that one set of wheels entirely rotted away within four months.

BIG 'BUS FOR MINNESOTA.

A big 27-passenger 'bus has been built by the H. E. Wilcox Motor Car Company, Minneapolis, Minn., for service by the Warner Company on the Iron range in Minnesota. The 'bus will run between Virginia and Biwabik, and if the service proves successful other machines will be purchased for suburban routes around Minneapolis.

G. M. C. FOR LUMBER FIRM.

A lumber firm in St. Louis, Mo., is now using five G. M. C. trucks instead of 20 horses, one vehicle having a capacity of 2.5 tons while the others carry five tons each. The first truck was bought two years ago and proved such a success that the firm has now displaced its horses entirely by motors. When the horses were sold, a few of the wagons were retained, and are now used about the lumber yard as "dead" wagons for making up the loads. Lumber is loaded on one of these while the motors are out on the road, and transferred without delay to them when they return, saving the time which would otherwise be consumed in loading the motor trucks.

TWO LARGE TRUCK ORDERS.

What is claimed to be the largest single order for motor trucks ever placed with one organization has just been given the International Motor Company, New York City, maker of Mack, Saurer and Hewitt trucks, by the Star Motor Delivery Company of Chicago. This concern is one of the largest in the country doing a general public trucking and transportation business, and has ordered 50 Mack machines of varying sizes, to be placed in service within the next few months for handling deliveries for Chicago merchants.

The City Fuel Company, also of Chicago, has ordered 25 Saurer vehicles for its coal delivery work, and in putting the first 15 of them in service, which will be done shortly, 70 double teams will be displaced. It is said that before placing the order the company carried on a thorough investigation extending over two years, so that its decision is a decided compliment to motor transportation as a whole as well as the Saurer truck. The 25 trucks will displace 100 horses and 25 wagons.

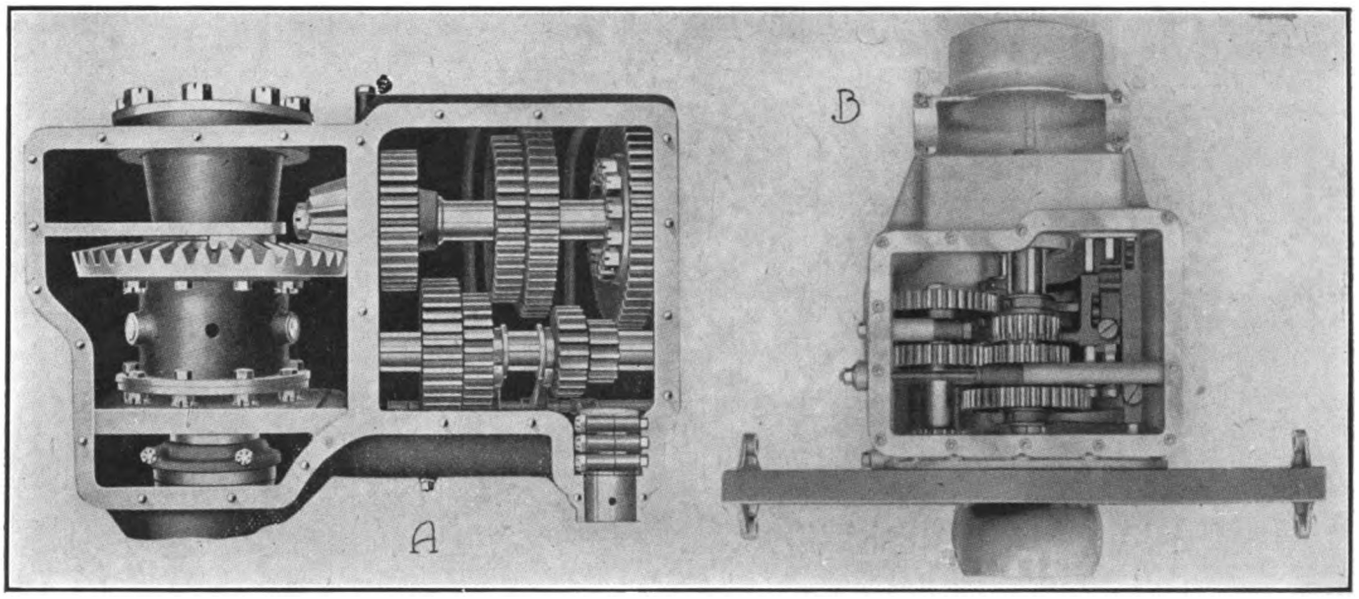
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CHARACTERISTICS OF TRUCK DESIGN.

Some of the Designs for Transmission Gearset and Differential Cases, and Jackshaft Assemblies, with Constructional Features---Typical Examples of Chain Cases.

THE efficiency of any service wagon driven by an internal explosion engine to a very large measure depends upon the manner of power application. The energy is created by the motor and it is transmitted through a driving system to the traction or road wheels. This system may be any one of several recognized by engineers as reliable and dependable, yet of these but one will afford absolute option as to the exact speed of the vehicle. This is the roller traction or friction drive.

To obtain to some degree the variation of vehicle speed that is desirable and efficient, with a reasonable regard for engine limitations, the reduction gearset has been employed, and this device has been designated as "transmission," which is in every sense a misnomer. There is, of course, a system for the transmission of power, which includes the gearset, but this may be one of several recognized types, the main purpose being to apply the power at right angles to the engine shaft. Very generally, however, the word "transmission" has been applied specifically to the means for reducing the application of power.



A, the Combination Gearcase and Differential Housing of the Garford Five-Ton Truck; B, the Four-Speed Gearset of the Newark 2.5-Ton Wagon, Worm Driven.

There is no accepted standard of reduction ratios. There are engineering principles to be observed, naturally, but the relation of engine shaft and road wheel shaft movement when not directly driven may vary according to the desire of the engineer, this being determined by differing means. It is understood, of course, that the power productiveness of each motor differs, but under any circumstances it is dependent upon engine speed, and, taken as an average, it may be said that there is a uniform increase of effective energy from the minimum to the maximum number of revolutions. Beyond the maximum the power decreases approximately as it increases.

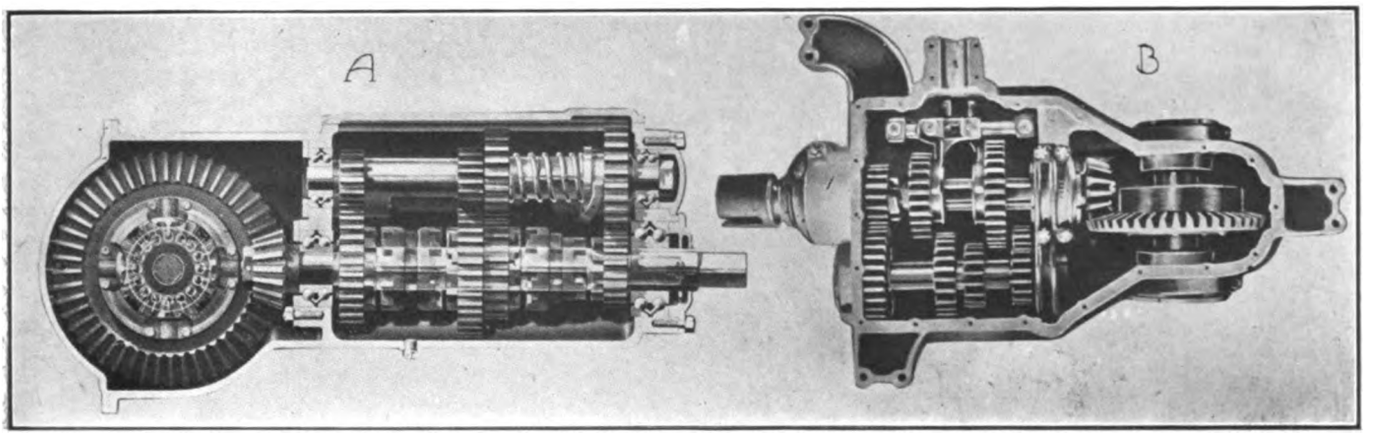
Then it will be seen that to obtain the greatest power an engine should be driven at a stated speed and with a reduction gear it is possible to apply it more slowly, proportionate to the ratios decided upon as being the most useful. There is no lessening of power with a gearset, save the slight frictional loss, but greater leverage is applied. With the conventional reduction there is the maximum, intermediate and the minimum ratios, the maximum often being the speed of the engine, the others, for the purpose of illustration, being two-thirds speed and one-third speed.

With pleasure vehicle engines, where the weight carried is small and speed is the essential, three steps or two reductions are generally regarded as sufficient, but occasionally a fourth step is used where the road wheel shafts will revolve faster than the engine shaft. This construction is not generally used in cars of moderate price. Its chief value is obtaining high speed under extremely favorable conditions.

With the service wagon, however, particularly if of large capacity, the need of more gradual power application is found and this has led to the adoption by several engineers of the gearset with four ratios, or the maximum and three reductions. In no instance has there been increase of road wheel shaft speed beyond that of the engine shaft. This type has been adopted for the Peerless, Lozier, Locomobile and Garford five-ton trucks, for the Peerless four-ton truck, for the Peerless and the Lauth-Juergens three-ton trucks, the Newark 2.5-ton delivery wagon, the Lauth-Juergens two-ton wagon, and for the Newark and the Garford 1.5-ton wagon, as well as for other makes, these examples being specified to establish the fact that practically all vehicles save the smallest have been included and that size or capacity is no actual criterion for need.

Any gearset must necessarily be subjected to severe stresses. One of the greatest cares by designers is to insure construction that will endure under all conditions of service. The service wagon motor is slower as a rule than those built for speed and there is not the same elasticity with the former as with the latter. The purpose of the gearset of four ratios is to better utilize the power and to more nearly approach a constant or uniform speed. Theoretically the engine should be driven at a standard for efficiency, which should be with regard to economy of fuel and lubricant and the least wear of the moving parts. If it

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A, the Sternberg Gearset and the Differential in Longitudinal Section: B, Top View of the Wilcox Transmission, the Differential and the Supporting Arms.

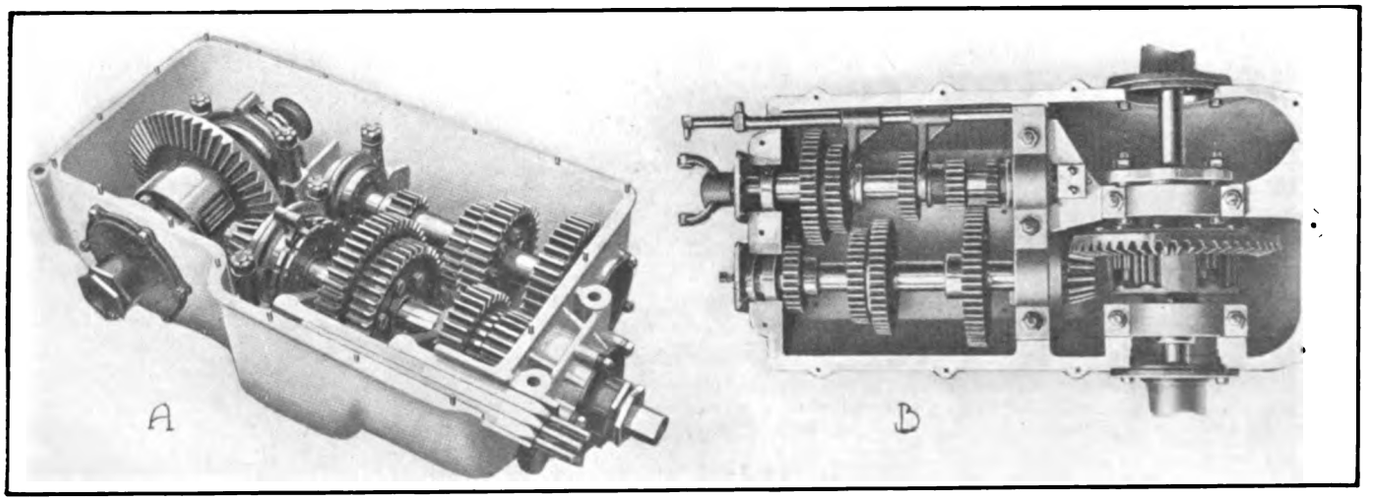
is practical to more effectively apply the power and obtain a given work with lessened consumption of oil and gasoline there is a distinct saving, and this has been the purpose of those who have adopted the four-speed transmission.

This type has been found to be very serviceable in every day use. It has distinct advantages as compared with the three-speed form and while it cannot be said that experience will bring about further increase of ratios it is a fact that this would be the ideal. The cost is necessarily larger than for the three-speed type and it has more moving parts, but these factors do not measure up to the gain made in better utilizing the power. Besides, there is generally lessened wear upon the vehicle as a whole, which is a matter of decided importance. The tendency with the majority of service wagon designers is to make the gearset large and enduring. Every component is proportioned with this purpose in view. The gearcase is heavy, the shafts sturdy enough to withstand springing, the gears wide and substantial and the bearings of a size to stand up under the continued stresses. The weight is not so much considered as the certainty of endurance and this is something that must be insured by all builders.

In the construction of the gearsets there are those who incorporate them with the jackshaft assembly, practically as a unit, and those who separate them. Some of the best examples of the unit construction are the Peerless, in which the gear set and the differential are housed in a single aluminum case, there being no division of the housing; the Locomobile, in which there is a dividing web between the gearset and the differential assembly, carried in a bronze case with an aluminum lubricant reservoir below both sections; the Garford, in which the gearset and jackshaft differential are in a single case, but separated by a web that carries pinion shaft and countershaft bearings; the Lauth-Juergens, in which both the transmission and the differential are similarly housed with a web dividing the case; the Lozier, which has the gearset as a separate assembly from the jackshaft, and the Newark, in which there is a coupling of the main shaft with a driving shaft carrying a worm gear above the rear axle assembly.

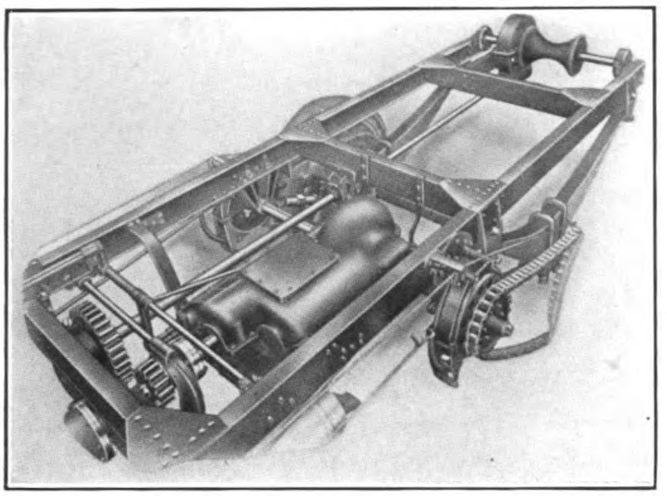
Of these the Peerless, the Locomobile, the Garford five-ton, the Lauth-Juergens and the Newark have gearsets with three reductions below the maximum, but the Lozier has the direct drive with two decreased ratios and one increase above the engine speed. The Garford 1.5-ton wagon has the same type of gearset as the Lozier so far as speed ratios are concerned. All of these save the small Garford have the countershaft of the gearset beside the driving shaft, and in the construction specified the countershaft is beneath the main shaft. Accessibility and ease of work when this is necessary, are two qualities sought that are seemingly fully realized.

Turning to the three-ratio gearsets, some excellent examples of construction are to be noted in the Wilcox, Sternberg, Knox and Avery, in which the assembly is in combination with the differential, each being a representative type. Of these the Sternberg is especially interesting in that all the gears are constantly in mesh and the changes are made by sliding individual jaw clutches on the main shaft. It is claimed for this construction that with the gears unchanged there is little wear, and with an aggregate parallel working face of 2.5 square inches for each set of



A, the Peerless Transmission and Differential Casing with the Cover Plate Removed: B, the Lauth-Juergens Gearset, Showing the Jackshaft Housing in Part.

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The Installation of the Knox Transmission and Jackshaft, the Gearset Being Enclosed in a Malleable Iron Case.

jaw clutches the strain and shock is minimized. The clutches are double-ended and may be engaged perfectly without the possibility of damage or stripping, no matter what the circumstances. With this gearset the countershaft is mounted above the driving shaft. When the drive is direct the two shafts are locked together and the gear is thrown out of mesh, the gears and the countershaft being idle. The gear is thrown back into position by the action of a spring when the sliding clutch is brought from direct into neutral. The transmission case and the differential housing of the jackshaft are assembled practically as one, there being the web between the two to carry the bearings for the gearset. The differential may be reached by a rear plate in the case which will permit work on the gears and the bearings.

The Wilcox transmission is conventional in its general design, but is made with unusually heavy shafts and wide gear faces so as to endure under extremes of service. The same comment may be made of the Knox transmissions, two in number, which are varied practically only in proportions. The gearset is mounted in a malleable iron case that is assembled with the jackshaft so that the two housings form practically a unit.

The Avery gearset resembles the Sternberg so far as the position of the shafts is concerned, the countershaft, however, being below the driving shaft instead of above it. The accepted form of construction with gears sliding on the squared driving shaft meshing with fixed gears on the driven shaft is employed. The transmission is not assembled with the jackshaft housing but the casings are bolted together. The Federal design has the transmission case, containing the gearset, bolted to the jackshaft housing, there being two distinct elements. The transmission construction is with the shafts side by side.

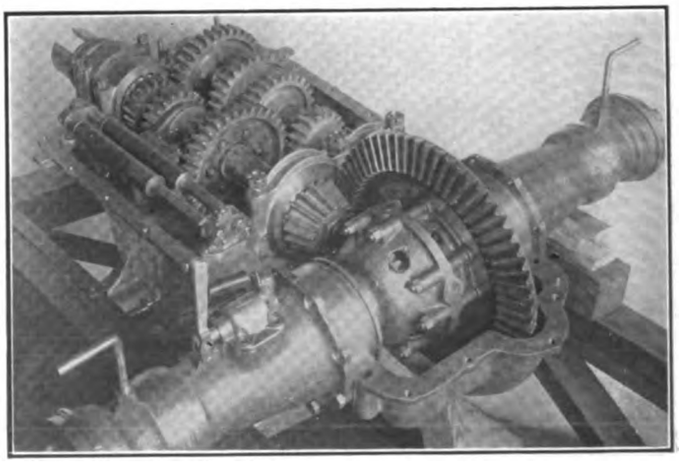
The manner of suspension of the gearcases differs materially. With the Peerless, for instance, the assembly is mounted on a cross member forward and the rear is supported by the jackshaft which is housed in a sturdy shell mounted in brackets fixed to the side members of the chassis frame. As a rule, as the jackshaft housing is designed to take the thrust of the traction wheels through the radius rods, and the strains of braking through the drag of the driving chains, the assembly is heavy and ought to endure much longer than the life of the vehicle. Wherever the design has been well thought out the construction is such as to provide for compensation for the distortion of the chassis frame and to prevent side leverage of the driving shafts on the bearings. With many of the machines the outer ends of the driving shafts are mounted on annular ball bearings that are installed under the centre line of the chain sprockets. This is the Peerless installation.

The Lozier construction is distinctive in that the jackshaft and gearset, as separate units, have a driving shaft between them. The transmission is mounted with the motor and clutch in a sub-frame and the entire power plant is carried on a pair of longitudinal auxiliary springs attached to the side members of the chassis frame, the rear end of the sub-frame being bolted to a frame cross member. As the sub-frame carries the radiator and the ignition system it is possible to remove it entirely from the frame with comparative ease. The jackshaft and differential are an assembly enclosed by a pressed steel housing suspended from the frame by two steel brackets. At the outer ends of the jackshaft shell are adjustable cages that carry roller bearings directly under the centre of the sprockets. The cages are spherical in form and these ball-shaped members are mounted in split eccentrics which form the forward supports for the radius rods. The eccentrics mesh with worm cuts on shafts that extend through the radius rod caps in vertical positions. The ends of the rods are squared and by the use of a wrench the radius rods may be adjusted as desired, loosening or tightening the chains as desired. The drive shaft between the gearset and the jackshaft shell is carried in a pressed steel torque tube, the front end of which carries a sliding sleeve with a spherical forward end, which is mounted in a housing at the rear of the transmission case. This housing is oil and dust proof and protects the universal joint and bearings from destructive influences.

With the Locomobile design the transmission case and the jackshaft housing are bolted together and the jackshaft shell is carried in spherical bearings in brackets attached to the side members of the frame. Distortion of the chassis frame is compensated by these spherical bearings and as the jackshaft and the transmission case are rigidly bolted together there is no possibility of the gearset or the differential and driving shafts being affected. A glance at this assembly impresses one with its proportions, and that it is not a probable cause for trouble is very certain.

In the Sternberg chassis the power plant and clutch are carried at the forward end of a sub-frame and the rear of this sub-frame is mounted on a steel bridge that is bolted to the jackshaft hangers. The transmission case is bolted to the differential case and the former is suspended on four arms on the sub-frame, the driving shaft extending between the clutch and the transmission, with two universal joints. It is claimed for this that it is impossible for the driving system to become misaligned, while the endurance of the mechanism is correspondingly increased.

The Lauth-Juergens transmission case is aluminum alloy and is very large and strong, it being supported at either side at the rear by the jackshaft housing, to which it is



The Locomobile Gearset, Showing the Assembly of the Jackshaft and the Casing, and the Unusually Heavy Housing.

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securely bolted. The forward end is suspended from a heavy frame cross member.

The Knox transmission is suspended at the forward end by a curved cross member of the chassis to which it is bolted, and at the rear by the differential housing, which is mounted in heavy steel hangers attached to the chassis frame side members.

The Newark trucks of 1.5 and 2.25 tons capacity have the unit power plant in which the motor and the clutch housings are supported by side arms bolted to the chassis frame, and the transmission case is bolted to the flywheel casing forward and is supported at the rear by a pair of arms fixed to the chassis frame, these arms serving as a chassis cross member, and carrying a spherical socket into which is fitted the forward end of the torsion tube and a member that serves as a coupling for the driving shaft.

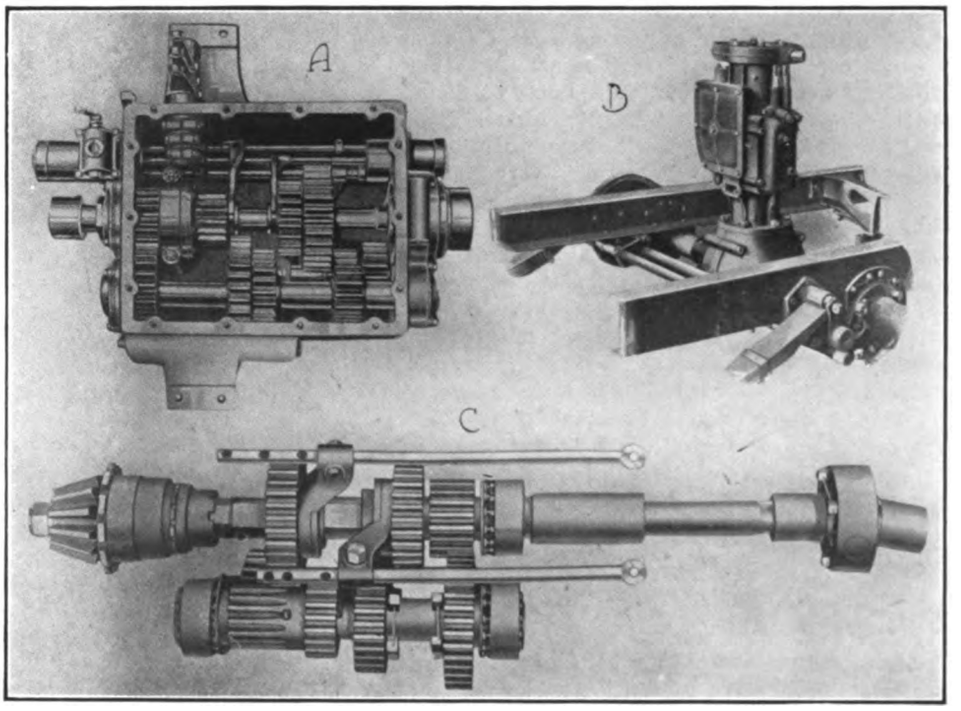
The Garford construction for the five-ton trucks has the transmission and the differential enclosed in a very large housing which is supported by the jackshaft shell at the rear and a cross member of the chassis frame forward. The hangers supporting the jackshaft are unusually large and the assembly has an appearance that is decidedly bulky. Considering the use and the stresses upon these components there is no doubt of the need of an ample margin of safety. The jackshaft is suspended very low and the angle of inclination of the radius rods is small, giving very nearly a direct push forward when the truck is loaded. This is an unusual quality and it is regarded as having especial value because of the minimizing of tractional stresses.

The greater number of service wagons are chain driven; that is, by side chains from the jackshaft to the dead rear axle, this construction being favored because of the very heavy stresses upon the axles from the loads carried. The proportion of the load weight upon the rear axle varies decidedly, from 60 to 95 per cent., but the average may be assumed to be perhaps 75 per cent. The side chain drive is exceedingly efficient if the chains are clean and well lubricated and the method has the quality of simplicity that is very desirable. Under ideal conditions the chain form of power transmission is at least the equal of any other, but the chains when exposed, quickly become covered with dust or mud which, retained by the lubricant, cause loss of power and material wear.

To secure the height of efficiency of the chain drive and to minimize the wear chain guards have been applied by a number of designers. It is not judicious to employ cases that are not substantial and enduring, and the desire is to reduce the weight so far as this is practical. The first constructions were generally of sheet metal of comparatively light gauge and it was found by experience that these were often damaged by contact with road obstructions. This was especially true of the guards used with the heavy vehicles because of the large diameter of the wheel sprockets and the necessity of affording them a sufficient clearance, this bringing the lower edges of the cases close to the ground.

Because of the guards being carried by the rear axle, and subjected to extreme vibration from road stresses, the first installations were generally found too light so far as the frames were concerned and the metal quickly became fatigued and broke. This led to heavier cases and consequently better results. Instead of the light sheet iron or steel housings that were not enduring, practise has demonstrated that it is best to have heavier cases that could be solidly bolted together and which, when supplied with lubricant, retained the oil or grease and gave satisfactory protection against abrasive substances. With guards the wear of the chains and sprockets has been minimized, and while this is a saving worthy of consideration, the economy of the time of cleaning and adjusting is another, to say nothing of the very much more important factor of maximum efficiency.

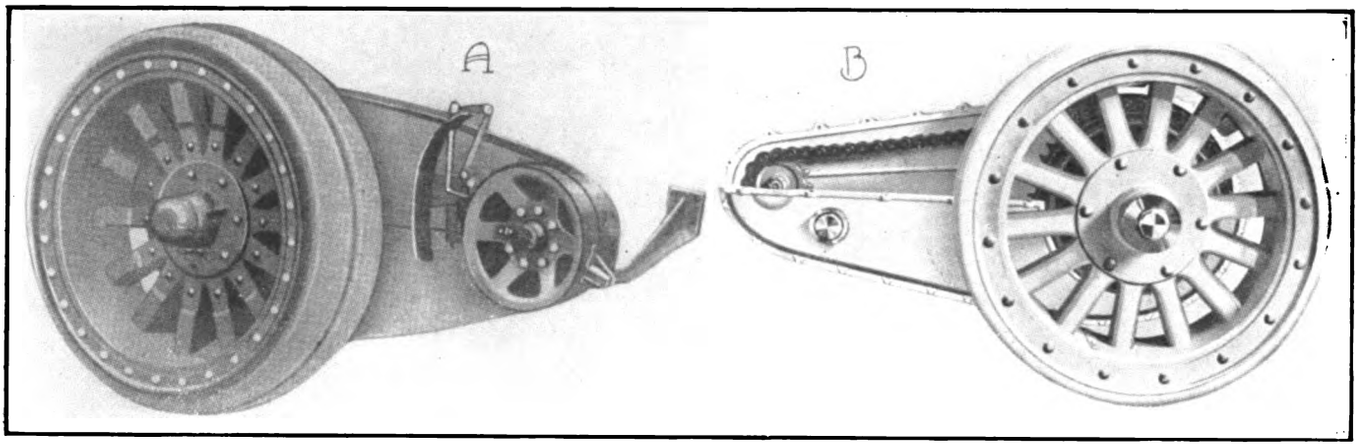
As the side chains are carried on sprockets at the ends of the jackshaft, and the jackshaft is supported by hangers from the chassis frame the chain case must completely enclose the sprockets and the chain with a considerable clearance that the chains may be adjusted. While the adjustment of the chains may be comparatively slight under ordinary circumstances, it is necessary to provide for adjusting. With some constructions this is accomplished by moving the jackshaft in its brackets with exactness, a telescoping coupling in the driving shaft preventing end thrust upon the transmission and clutch. With others the rear axles and the jackshafts are fixed and the chains are shortened as may be desired, by the use of half links or whole links.



Transmission Constructions and Assemblies: A, the Lozier Four-Speed Gearset: B, the Federal Jackshaft and Gearcase in the Chassis: C, the Avery Driving Shaft, Pinion Shaft and Transmission Gears.

The relation of the rear axle and the jackshaft is maintained by radius rods that are provided with means of adjustment at the jackshaft. Where the service brake is carried at the outer ends of the jackshaft the sprockets and the radius rods are also outside of the chassis frame, and as the case must be supported this necessitates the fourth attachment to the jackshaft housing. The guard must be movable so that the chassis frame may rise and fall without restraint or bringing strain upon the casing, this being true of the rear as well as the forward attachment. The outer side of the rear of the case generally surrounds the brake drum, these drums occasionally carrying the rear sprockets.

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Some Examples of Chain Cases: A, the Lozier Pressed Steel Guard: B, the Stegeman Cast Steel Housing That Serves as a Radius Rod.

The inner side is fitted to the axle, sometimes firmly fixed.

These cases are sometimes made with a skeleton to enclose the chains and the sprockets, this construction reducing the weight. Such is the design used with the Sandusky wagons, there being a clearance of several inches for the chains to slacken through wear. As a rule, however, the cases are not so lightened. Some of them are of cast steel, others of pressed steel, the former type being generally made with bridge work inside to minimize the weight. The cast steel housings are usually very rigid and substantial and are much lighter than they appear. They are all made in sections, some with the dividing line on the centre of the jackshaft and the rear axle, some with a third section that may be removed so that the rear sprocket may be examined and work performed on the chain at the rear, while others are with the inner side and frame cast recessed and fitted on before the wheel is installed, with the outer side divided longitudinally in the centre.

The usual manner of attaching the case is by bolting the sections together with a series of small bolts, but as these are all readily accessible from the outside there is but little labor required to sufficiently expose the interior of the case for any necessary work. Most of the cases are fitted with large handholes and cover plates that are clamped tightly, so that examination may be made or lubricant supplied in a comparatively brief period.

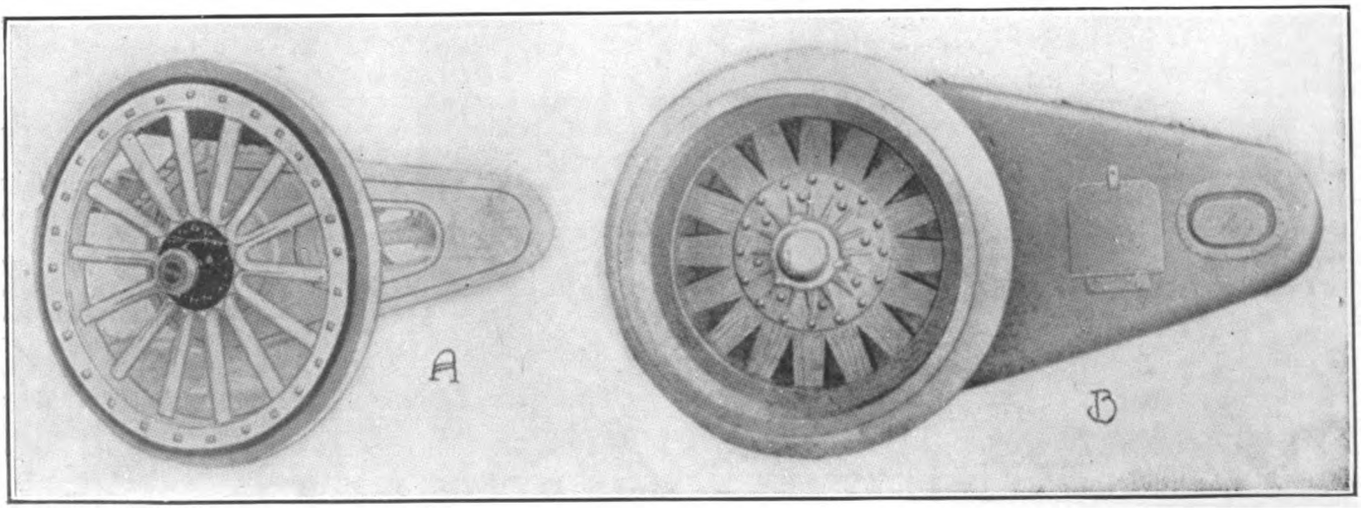
The chain guard will undoubtedly become more generally used because the cost is very small compared with its serviceability, and as the chain driven vehicle is regarded by many as being the simplest form of construction there is no good reason why the fullest protection that is possible should not be given, and the greatest efficiency obtained.

The Lozier five-ton truck chain case is formed of pressed steel, divided longitudinally and bolted together. The inspection hole is in the upper half. The case is mounted with a large brass collar rotating in a groove in it, this collar being carried by the jackshaft sprocket, so that the chain may be adjusted without disturbing the case. With the Stegeman truck the chain case is a steel casting strengthened by bridge work and serves as a radius rod, there being an adjusting device by which the thrust of the rear axle from driving stresses is equalized upon the outer end of the jackshaft.

FRENCH WAR TRIALS FOR SUBSIDY.

During July the French War Department is to conduct trials of motor trucks with a view to determining the grade scale of subsidies allowed by the French government to owners of trucks which are fit for military, as well as for commercial work. The trials are to be conducted with Versailles as a centre, with all vehicles parked in the historic place every night, under military guard. At present 16 manufacturers have entered 76 machines, so that there will be no lack of contestants.

Newburyport, Mass., is to purchase an automobile chemical truck, the city council having voted to that effect recently. The chief of the fire department has been advocating the purchase of such a machine, believing that it would result in economy to the city and afford better fire protection as well.



Two Forms of Chain Housings: A, the Sandusky Lightened Guard: B, the Pressed Steel Avery Case.

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PUBLIC COMMERCIAL CAR SERVICE STATION.

Methods Which Insure Proper Care and Constant Use to Business Men Who Are Unable to Maintain Their Own Vehicles with Economy---Some Suggestions as to the Necessary System for Solving a Decidedly Timely Problem.

THE business man who maintains his own delivery equipment meets with a serious problem when he considers changing from animal to motor wagons. Experience has demonstrated that it is economical to stable the horses and provide attention as compares with the service of public stables. It is assumed that the ratio of economy increases with the number of animals used. Having knowledge of stabling and care and maintenance expense the inquirer often accepts, sometimes without question, a continuation of this system as being imperative to realize the fullest value of the power vehicles. Having experience as owner of a pleasure car and not differentiating clearly that this machine has been used with more or less indifference to expense, and basing conclusions upon suppositions and insufficient information, the prospective purchaser frequently decides that he ought to be independent of all public service to obtain the most practical results.

DAY REPORT—TRUCK SERVICE.

	Out	In	Out	In	Odometer reading	Gasoline, gals.	Oil, qts.	Grease, lbs.
Truck No. 5....	6.55	11.40	12.35	5.20	1728.6	15	3	5
Truck No. 2....	7.04	12.15	1.10	6.05	3308.2	10	2	.
Truck No. 9....	7.12	11.55	1.02	5.50	4117.5	10	.	.
Truck No. 7....	7.21	....	....	6.10	2738.3	10	3	3
Truck No. 1....	7.27	12.07	1.05	5.38	1561.9	8	1	.
Truck No. 3....	7.32	....	....	7.14	5126.0	12	2	.
Truck No. 4....	7.36	11.48	12.50	5.41	3811.4	18	4	2
Truck No. 6....	7.41	....	....	6.17	2812.8	10	.	.
Truck No. 8....	7.44	....	....	6.29	4614.1	15	2	4

Form 1, Sufficient Length for Entry of Record of Each Truck Daily—Sent to Office by Foreman.

With the single animal or the team as a unit a delivery may have been developed, but what may appear to be equipment of considerable proportions shrinks decidedly when the motor truck, for instance, takes the place of three two-horse teams. The stable that has been sufficient for 12 horses and six wagons, to illustrate, is seemingly much too large for merely sheltering two trucks. Quarter the barn floor area will suffice to house the machines, and aside from a work bench and small storage facilities nothing else is required. A gasoline storage tank is desirable, but not necessary. To continue the use of the stable as a garage appears to be a waste of money. To change to a smaller seems to be a logical conclusion.

Character of Care Required.

The trucks are not regarded as experiment. They are justified as practical vehicles by the experience of others. It is necessary that they be serviceable during the day and this means that each driver must do a full day's work. Whatever care and attention is desirable ought to be given after working hours or the service of the machines lessens in value. Obviously the trucks should be systematically examined and adjustment or repair made immediately. If the drivers are capable of doing this mechanical work they cannot be expected to work extremely long hours, and if the work is to be principally at night there must be equipment that would not be required were it possible to command the outside facilities available during working hours of the day.

Regarding the condition practically it is realized that there may be many nights, when the care needed should be nothing more than washing, polishing, replenishing the fuel, lubricant and water supplies, oiling and turning the grease cups, filling the lamps and cleaning the engine. Aside from the washing and polishing not more than an hour should be required, and often less time. This attention must be given, however. There will be other occasions when the work may require hours, and sometimes more than one man, because the trucks must be ready for use if it is possible to have them serviceable. Accidents cannot be foretold, but they must be expected and provision should be made to cope with any situation that can reasonably be anticipated.

Obviously it is not economy to have a regular employee capable of doing the high class work essential to insure satisfactory operation of the trucks. He would not have enough to do to keep him occupied. If this service could be combined with another or others to warrant the employment of a skilled man that is another condition. Generally such combination is not possible and the average or usual situation to be met with is regarded. To hire a man for the work stated is an insurance, but it is not economy. To pay a man for the actual labor required would mean paying well for it, because a dependable mechanic could not be expected to devote himself to such employment unless his price were paid.

Then the condition is, that the man whose delivery service is such that he cannot afford a well equipped private garage to maintain it must either sacrifice some of the economy he seeks until it has increased to such proportion as will warrant every facility, a development that must necessarily be slow and dependent to a considerable extent upon the satisfaction he gives to his patrons.

The Public Service Station.

The alternative is to turn to the public service stations, which are generally devoted to pleasure vehicles, and with these the methods usually the vogue are not conducive to the character of service a business man must have. There are stations where admirable attention is given, but what is stated applies generally and not specifically to all. Under ordinary circumstances the mechanical force is employed during the day, and night work is an accommodation. Overtime must be paid for at regular rates. The night workers are cleaners as a rule and few stations pretend to afford the same character of service day and night. In such stations, too, the drivers do not have access to the machine and tool facilities and the stock, for these are never left accessi-

TROUBLE REPORT.

Date .....

Truck No. 4—
Loose service brake
Carburetor flooding

Truck No. 7—
Leaking gasoline tank

Truck No. 9—
Knock in motor

Form 2, of Size to Meet Requirements—Sent to Office by Foreman.

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ble to those not responsible. The lock and key are surprising preventions of leakage and loss.

Contrasting the private and the public garage the rental of the one must be as against the price paid for storage.

SUGGESTIONS TO OWNER.

Date .....

O'Neill & Mulligan
Truck No. 5—
Brakes relined (necessary)
Cylinders cleaned
Valves ground
Repair left rear tire (necessary)
Probable time required

Form 3, Small Sheet, Padded, in Two Colors of Paper—Original Sent to Owner and Copy to Office for Record.

The washing, polishing, protection and the working facilities for the driver in the station are included in the cost, and the last mentioned offsets the expense for some equipment. The difference in cost of gasoline, oil, grease, waste, and similar supplies eventually eats up the initial cost of a storage tank and fittings. There must be a profit for the station, but the real concern with the truck owner is not that profit, but his own, to insure which he must keep his machines as continuously in operation as is possible.

The rapidly increasing utilization of the motor wagon has brought the business man to require of the public garage a character and quality of service not previously demanded, and the garage manager faces a problem that is quite as perplexing as that the truck owner is contemplating. It is apparent that this condition must be met and that it must be purely on a basis of business merit. No other factors are worthy of attention. The principal business of many garages will eventually be with service wagons and this being so the earlier this foundation is reached the better. It is possible for the garage to afford to owners of wagons who desire service a better attention than they could secure in their own stations, and at a cost that is sufficiently economical to satisfy them under all conditions.

A Concrete Example.

The example of service is that given by the Central Garage, Pawtucket, R. I., conducted by Fred H. L. James. Mr. James is a draftsman by profession who advanced to the management of a large and extremely high class machine works, and has an experience that has been especially valuable to him. His health required him to abandon work for several years and he engaged in his present business because it was convenient to his home and permitted him to be out of doors the greater part of his time.

Mr. James' knowledge of business methods and men was such that he met conditions as they arose with entire success, and he has developed in connection with his garage a service that is in every way practical, economical to his patrons and sufficiently profitable to justify this class of custom quite as much as any other. For the benefit of those who may seek to profit by the suggestions of this article it should be stated that the prices charged at the garage are average. When Mr. James took over the business there were numerous losses and leaks that were sought and remedied. This was a condition that might obtain with any man. Eventually a system was adopted that has proven extremely satisfactory in every respect. Emphasis is made of system because suggestions are made that may be employed to good advantage in following the general idea of a service for motor wagons, and it is imperative with any business to have record of every transaction in the simplest and most practical form. It should be said that these are not the forms used by the Central Garage, but are what appear to be desirable with any volume of business of this nature.

Arrangement of Cars.

It may be well to state that at times the combination service causes conditions that are unavoidable where the two classes of vehicles are in storage, particularly Sundays when rain falls and it is necessary to work on the trucks, for they take up much floor space and with cars constantly going and returning there is necessarily congestion. It is not possible to interfere with the work on the trucks and it cannot be slighted, so that to obtain the most practical results a systematic arrangement of the cars in the garage is first of all to be decided on. Other days the trucks are worked during business hours and it is seldom that more than one at a time is receiving attention, so that space is not so greatly needed.

The service referred to was started with a single truck and it has been so well conducted that now five firms having one and two trucks avail themselves of it rather than establish their own garages. The prospects are that this will be largely developed the present season. It is probable that this will lead to a separate station, wholly for the trucks and wagons.

The attention given is of two classes. The one is a standing order for such work as is necessary to maintain the trucks in a thoroughly serviceable condition. The other is where work is authorized by the firms upon notification of conditions. The expectation is that the machines will be ready for work each morning and this requirement must be met. In several instances this has meant work the entire night for some of the men, but in only two instances has there been failure; once when an engine case was damaged beyond any form of repair save welding, and another time when a shaft was not delivered as ordered. Taking four years' service this is a thoroughly businesslike showing.

The Service Given.

The service first covers storage during the time the trucks are not in use, daily washing and polishing, oiling and tightening the grease cups, filling and cleaning the lamps, cleaning the engine, and replenishing the fuel, water and lubricant. The care is for a regular monthly charge. The supplies are charged in the quantities used. The most important thing is the attention to the mechanical condition of the trucks. The foundation of this is the reports made by the drivers, who are required to report to the foreman or the office any trouble experienced or conditions noted during the work of the day. When the trucks are driven into the garage the engines are operated within the hearing and observation of the foreman or Mr. James, and usually any derangement or fault may be detected. If there are in the reports any evidences of needs of adjustments, breakages, or damage or wear, these are inquired into immediately and necessary work is begun at once.

Experience has proven that it is well to take all the time available, because of possibilities of other developments, and as the mechanical force is limited no chances

AUTHORIZED REPAIRS—SPECIAL WORK.

Date .....

..... Truck No. .....
Owner Hubbard & Hotchkiss
1 Weld crankcase
2 New high speed transmission gear
3 Repair radiator.

1 Sent to J. F. Ellis Company, Rochester, N. Y.
2 Gear blank forged in shop, cut by Willis & Baker
3 Sent to maker, Fedders Company, Buffalo, N. Y.

Form 4, Small Sheet, Padded, in Two Colors of Paper—Original Sent to Owner and Copy to Office.

can be taken. Where a work can be completed it is taken care of, but in some instances a temporary repair is made until restoration of a permanent nature or replacement is practical. There are times when the tightening of a bolt or

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the adjustment of a part will mean the saving of many dollars and nothing needed is left undoue, but as a rule the work each night is not such as to require much time. Because this care is taken daily there is but little to anticipate aside from actual breakage.

But each Sunday the trucks are systematically inspected and gone over. The engine is run to determine its condition, the radiating, ignition and lubricating systems are examined, the clutch is tested, the transmission cover is removed and the gears tried by feeling, the chains are loosened and the jackshaft, its bearings and differential are operated by hand to detect lost motion or wear, the brakes are operated and the connections gone over. Next the wheels are jacked and the condition of the bearings learned by testing with a pinch bar, and the steering gear and the lever arm, tiebar, knuckles and pivots are examined carefully. The radius rods and chains are looked over and the springs are seen to. The work is thorough and the men tighten every bolt that is slack, make such adjustments as are needed, and test the trucks on a short but steep hill. The workmen are expert in the inspections and the trucks are left ready for the work of the week to come. The charge for work is for the labor, plus the cost of any parts or material used.

It is a rule that no work shall be regarded as completed unless it has been tested, and nothing is taken for granted. This means that when the trucks are worked on at night they are tried out so that they will be in condition to use when the drivers call for them in the morning. The result of this service is that the trucks are always available and there is practically no time lost except when withdrawn for painting or perhaps an overhaul. The real economy is in having them always serviceable.

The Necessary Equipment.

The garage equipment must be equal to all demands made upon it. This does not mean unprofitable machine tools, but in special fittings that will make possible work out of the ordinary requirements. There should be at least one first class lathe with the regular and the special gears that will be useful in milling, for instance, thread cutting, and the like; a drill press is very useful, and other tools may be utilized to good advantage. A power air compressor is absolutely needed for the forge and brazing outfit. There should be a complete forge and the tools for working it, and the hand tools should be such that there will be enough for every worker. The stock of material should include bar nickel steel for shafts, steel tube for axle housings, bar steel to five inches diameter for gear blanks, as well as the usual rod, bar and sheet metal necessary in repair work.

The workmen should be the best that can be secured and one of them ought to be a first class blacksmith, capable of doing any work. One of the faults with most garages is that they have the forges and no men who can do the work required. To illustrate in the event of a gear being needed and the maker a long distance away it is possible to forge a steel blank and have it cut outside, for few stations have milling or gear cutting machines. A broken front axle may be plated and brazed for a temporary or even a permanent repair, and fractured rods and parts welded or hand forged. A good blacksmith can fit the work he is making and minimize the other labor upon it. The better the machine men understand the value of their tools the more satisfactory the results. A broken axle shaft can be replaced, even to milling the square ends and cutting the threads, on an ordinary lathe. No end of work can be accomplished with the lathe, which is the most useful of tools.

The Garage Manager.

The resourcefulness of the garage manager is a large asset in business. To meet an emergency and deliver the trucks on time is what brings him patronage and retains his customers. Only in the event of impossibilities should he fail, and then he must give sufficient notification to the firms dependent upon him to permit arrangements to be made for the delivery to continue. A broken engine case of aluminum cannot be welded with ordinary garage facilities and a repair is not even guaranteed by those who spe-

WEEKLY INSPECTION.

Date .....

	Adjusting	Repairs	Parts	Supplies	Total Mileage
Engine—					
Compression					
Valve timing					
Cylinder condition					
Ignition—					
Magneto circuit					
Battery circuit					
Spark plugs					
Cables					
Battery voltage					
Cooling—					
Radiator					
Fan					
Pump					
Lubrication—					
Pump					
Sight feed					
Piping system					
Level and drain cocks					
Reservoir					
Clutch—					
Engagement					
Slipping					
Condition					
Transmission—					
Gears					
Bearings					
Hand lever					
Condition					
Brakes—					
Hand lever					
Foot pedal					
Driving System—					
Shaft					
Universal joints					
Jackshaft					
Differential					
Sprockets					
Chains					
Radius rods					
Wheels and Axles—					
Rear axle					
Bearings					
Brake drums					
Tires					
Condition					
Front axle					
Spindles					
Pivots					
Yokes					
Tires					
Condition					
Steering Gear—					
Post and connections					
Draglink					
Tiebar					
Condition					
Springs—					
Clips					
Saddles					
Shackles					
Grease Cups					
Oil Caps					
Hub Caps					
Lamps					
Gasoline Tank					
Oil Tank					
Tested Before Adjusting					
Tested After Adjusting					
Tested Before Repair					
Tested After Repair					

Form 5, Ruled to Be Filled In by a Note in the Appropriate Column for Each Item Stated, and Signed by Those Doing the Work and Testing—Original to Owner and Copy to Office.

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cialize repairing. It must be sent to the specialist or the maker or replaced. Such an accident means unavoidable delay provided the engine cannot be replaced by another.

Where the truck is built a long distance from the owner it is well for the buyer to have on hand such parts as might be needed at any time. If there is an agent within a reasonable distance he may be depended upon for replacements, but there may be some delay in securing them in the event of emergency. If the maker has a branch, or if the factory is near at hand the need of parts need not be apprehended. The garage, however, cannot be expected to carry parts unless it is agent. In considering service it is well to understand the possibilities in the event of necessary restoration and to make the provision that appears wise to do. This is a matter that the owner, and not the service station manager, has to deal with.

Desirable Forms.

For the benefit of those who might desire to adapt their service to trucks a series of forms has been prepared which are practically self-explanatory. The first is the day report,

MONTHLY REPORT.

Date .....

..... Truck, No. .....

Owner, Hubbard & Hotchkiss

Hours of service (Out of Garage)

Mileage, odometer reading ..... to .....

Gasoline (total gallons supplied)

Lubricants—
- Oil, (cylinder) gallons
- Grease, (gear and transmission) pounds

Supplies—
- Spark plugs
- Cable
- Gaskets
- Bolts and nuts
- Brake lining

Parts—
- Mudguard bracket
- Eight valve springs
- Fan belt

Labor—
- .... Repairing mudguard
- .... Adjusting ignition system
- .... Timing valves
- .... Replacing fan belt
- .... Adjusting brakes and relining shoes

Condition—
- .....
- .....
- .....
- .....

Suggestions—
- .....
- .....

Form 6, Signed by Garage Manager in Duplicate, Original to Owner, Copy to Office.

which conforms to law in many states as to the registration of vehicles leaving and entering a garage, together with the odometer reading, the quantity of gasoline, oil and grease supplied for replenishment. The second is the report of the foreman which notes the conditions reported by the drivers.

The third is a statement of necessary and desirable repairs to be sent to the owners as official notification, this establishing a responsibility for any condition that might arise for failure to authorize the work needed. The fourth is the statement of outside work sent away, to establish any cause for delay or failure when returned, and that the charges were legitimate. The fifth is a weekly inspection and work record, which indicates that all parts of the machine received attention and that adjustment, repair or replacement was made, with the time for the work, together with such supplies as were necessary and a reading of the odometer to show the work of the truck during the week. The sixth is a monthly report to accompany the bill, which gives the hours of service for the month, the mileage, the fuel, oil and grease used, the supplies furnished, the parts required, the charges for labor other than regular attention, with a summary of the condition of the truck and suggestions as to work needed or desirable.

It will be understood that the value of the weekly report is to show that the truck was systematically examined and the proper care given. The monthly report details the cost of operation aside from the service charge, which, with the other detail available, gives the owner an accurate account of the expense of operation. As it is for the interest of the station to keep the expense within reasonable limits, and as the owner desires economy, the reports are equally valuable.

SUMMER INFLUENCES TRUCK SALES.

With the approach of summer, truck purchases have been increasing in number steadily, and next July and August will without doubt see fewer horses than ever toiling in the hot city streets and rendering them unsanitary, according to Gleeson Murphy of the General Motors Truck Company. During the heated period last summer, in New York alone, 1200 horses dropped dead in one week. The companies whose service was so crippled then are taking heed to the lesson which was so costly, and purchasing trucks which are not affected by hot weather or cold. The horse compels the expenditure of thousands of dollars to keep the streets clean, where the truck costs nothing to the city, so that it is not inconceivable that in time horses may be prohibited in certain sections of the larger centres.

VELIE FOR ARSENAL.

The United States government has purchased a Velie three-ton truck for the use of the arsenal at Rock Island, Ill., as a result of careful tests by the ordnance department. The truck will be used for the handling of ammunition caissons, powder, shells and the heavier supplies, which work has heretofore required many horses. It already has demonstrated its value, having done remarkable work under all sorts of road conditions, at times towing three loaded box cars as trailers.

NEW BEDFORD WANTS MOTORS.

A new motor driven ambulance, patrol wagon, and a prison van are needed in New Bedford, Mass., according to H. W. Mason, chief of the police department, and the proposition is being considered by the city authorities. Chief Mason has some ideas of his own as to bodies, and wishes the city to purchase the chassis and have bodies fitted to his designs by local firms. The city was an early purchaser of motor equipment, and still operates an automobile ambulance. This is, however, now too old to render efficient service as it did at first. While it seems that the city needs motor equipment immediately, it is probable that it will not be purchased until the new police station is constructed and room gained in which to house the new machines.

MORE PATROLS FOR NEW YORK.

Three more motor patrol wagons were recently put into commission in New York City, making the complement of horseless patrols five in number. The new cars are of the gasoline type, while the two electrics have been used for some time. If the new machines prove as satisfactory as is expected, it is stated that within a short time all of this class of vehicles in the city will be motor driven.

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THE WAVERLEY INSTRUCTION BOOK.

The Waverley Company, Indianapolis, Ind., has issued an instruction book for the use and operation of its electric trucks. It contains but 12 pages, and amply bears out the statement in the front that "The care and operation of electric commercial vehicles is no more trouble than stabling horses."

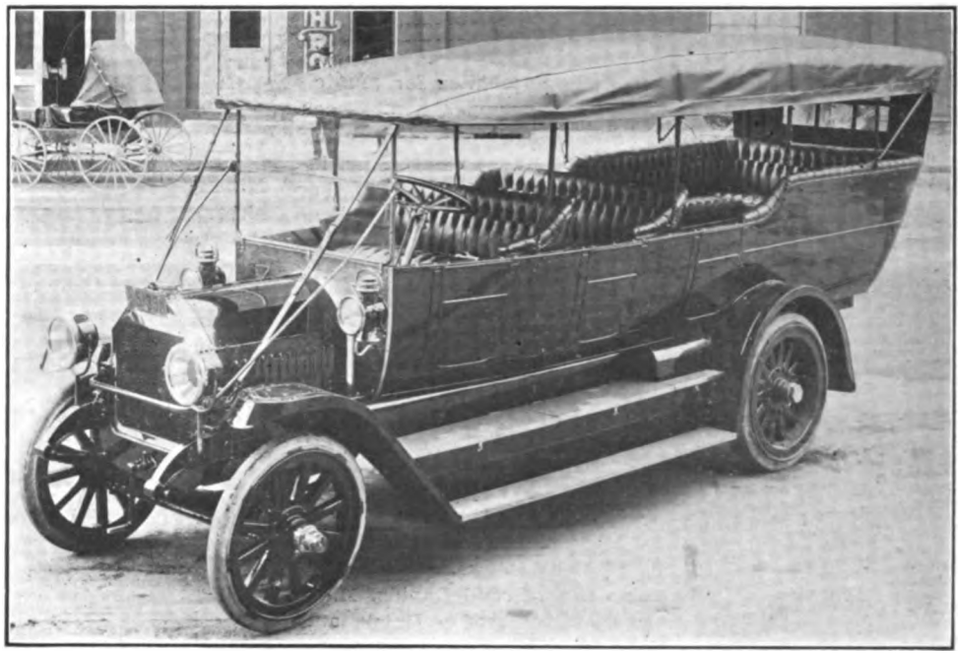
MILTON NEEDS CHEMICAL TRUCK.

The Shimer Hose Company, Milton, Penn., has started a campaign for a motor chemical truck, and as the city does not seem inclined to purchase it, a fund has been started to raise the necessary money among the citizens of the town. No machine has as yet been decided upon, but the hose company is hoping to get enough money to purchase one of the most modern type.

NEW SIGHT-SEEING CAR.

The General Motors Truck Company, Detroit, has brought out a new sight-seeing body which exhibits some distinct characteristics. It is a full fore and side door model and is a distinct advance from the old style. The body is built along the lines of the pleasure car, having the appearance of an elongated touring car. The seats are well arranged, the front two being crosswise, as usual, while the back seat is semi-circular. Sixteen people may be carried with comfort, and the appearance and refinement of the new vehicle will no doubt appeal to tourists and others.

The chassis is a standard two-ton G. M. C. construction, with a wheelbase of 142 inches. The first 'bus finished was shipped to the Rainier National Park, near Seattle, Wash., and is to be used in conducting parties through the park to the line of eternal snow on Mount Tacoma, along what is considered by some to be the greatest scenic automobile ride in American territory. Incidentally, this work will prove a severe test for the new car.



New G. M. C. Sight-Seeing 'Bus, Built Along Pleasure Car Lines and Holding 16 Passengers.

ADAMS EXPRESS ADDS MORE ELECTRICS.

The Adams Express Company, New York City, recently ordered 37 two-ton G. V. electrics, produced by the General Vehicle Company, Long Island City, N. Y., making a total of 124 cars of this type which the company has purchased to date. That electric vehicles are popular with express companies is borne out by the fact that the American Express Company recently ordered 58 machines, the last five of which were delivered a short time ago.

COMBINATION PATROL FOR BOSTON.

The first combination motor patrol and police ambulance to be put into commission in Boston was recently installed in the West Roxbury station. The body is fitted in the interior with folding seats for 24 men, and can be used as an ambulance by simply folding up the seats and placing the stretcher, which is carried on the wall, on the floor. A medicine chest with first aid remedies is provided. The car will cover the West Roxbury and Hyde Park districts, an area of nearly 50 square miles.

LEE TIRE COMPANY EXPANDS.

The tire business of the Lee Tire & Rubber Company, Conshohocken, Penn., has increased to such an extent that during the past year it has outgrown its quarters in the new factory buildings which had been just completed, and it has now placed orders for additional machinery and equipment which will double the present output to almost 800 tires a day. The power plant will be increased, the present mill room doubled, the calenders triplicated, and the washers and vulcanizers duplicated. A new compound room is also to be built.

GRAMM COMPANY REORGANIZED.

At a meeting of the directors of the Gramm Motor Truck Company, Lima, O., May 23, the final reorganization of the company, the controlling interest of which was purchased recently by John N. Willys of the Willys-Overland Company, Toledo, O., was completed. B. A. Gramm resigned the vice presidency, and it is understood that he will reenter the commercial vehicle field with new designs in the near future.

The new list of officers follows: President and general manager, John N. Willys; vice president, G. W. Bennett, vice president of the Willys-Overland Company; secretary, James E. Kepperley; treasurer, Walter Scott; assistant general manager and factory manager, Harvey L. Hooke. Under the new plan, the sales will be made through the commercial car department of the Willys-Overland Company, and the policy will be directed from Toledo.

In this connection it is announced that Carl A. Neracher, who for several years was chief engineer of the Garford Company, Elyria, O., has been appointed consulting engineer of the Willys-Overland Company, and will have charge of this detail in connection with the Overland and Gramm products. Mr. Neracher's experience extends over several years. His headquarters will be at Toledo, although F. Biszantz will remain as resident engineer of the Gramm plant at Lima.

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WAVERLEYS FOR DEPARTMENT STORE.

The Mandel Brothers department store, Chicago, has ordered a fleet of 10 Waverley electric light delivery cars, for city use in delivering the lighter merchandise. This order followed a competitive demonstration on the cost of maintenance and ease of handling, and it is stated that the noiselessness of the cars also figured in the calculations of the company in giving the order, as it feels that a quiet electric gives customers a good impression.

LONG RUN WITH SAMPSON.

A Sampson motor truck, made by the Alden Sampson Manufacturing Company, Detroit, recently made a trip from New York to Baltimore, Md., with a full load of household goods. The distance is 180 miles and was covered in only 15 hours running time. Only one stop was made along the route, which ran through Trenton and Philadelphia. This is stated to be one of the longest motor truck household removals on record, and created a good deal of interest. The furniture carried by the machine arrived at its destination without a scratch, and of course much quicker than had it been sent by freight.

WESTFIELD WANTS MACHINES.

Westfield, Mass., would secure automobiles for municipal use, and an effort is being made to have the selectmen purchase machines for the use of street and engineering departments. The work of these two departments has increased steadily during the past few years, necessitating the superintendent of streets keeping a team at his own expense, in order to be able to direct the work in the different sections. The health and water departments both have machines and have found them of great value, it is stated, making it possible to cover more ground and thus accomplish more work, so that in view of the success of these it is not unlikely that the other vehicles desired will be purchased.

DECATUR FOR GENERAL TRUCKING.

George E. Sturdevant, who conducts a trucking business in Danbury, Conn., has just bought another motor truck, this time a two-ton Decatur, Hoosier Limited, made by the Grand Rapids Motor Truck Company, Grand Rapids, Mich. Mr. Sturdevant about a year ago purchased a Buick, and found it so successful that with an increase of business he decided to purchase a larger machine. He stated that the Buick frequently did the work of two horse teams, and that he expects the new machine to do even better than that.

NEW HAVEN CHIEF'S WAGONS.

The fire chiefs of the city of New Haven, Conn., have been furnished with two new Ford runabouts, and now lose no time in getting to fires. The machines are equipped with chime gongs instead of a horn or whistle.

TRAVELLING MOTOR LIBRARY.

The latest use for the automobile is to furnish a conveyance for a travelling library, the public library of Hagerstown, Md., using an International Harvester wagon for the purpose of delivering books from door to door in the rural districts of Maryland. The car has a van body which holds nearly 1000 volumes, some in special cases to be left at the 70 sub-stations of the library, and some on shelves for the selection of the farmers along the route where the population is too scattered to maintain sub-stations. The machine is fitted with a 20 horsepower motor and is especially equipped to travel over the mountain roads of that section.

G. M. C. TRUCKS ABROAD.

The General Motors (Europe), Ltd., has been incorporated in England, and will act as distributing agent for the General Motors Company lines in the British Isles, continental Europe, Scandinavia, Russia, northern Africa, India, Burmah, Malay and the East Indies. The foreign company is modeled on the lines of the well known American organization, of which the General Motor Truck Company, maker of G. M. C. gasoline and electric trucks, is a constituent.

HOSE WAGON FOR MANCHESTER.

The firemen of Manchester, Conn., are of the opinion that an automobile is needed in the department, to carry hose and supplies for the South Manchester house. Already the department has several machines in operation with entire success. The South Manchester house is handicapped by not having enough horses, particularly in the day time, when two of the animals are used by another city department, and a truck is advocated as a solution of the problem.

TRUCKS FOR JACKSONVILLE DOCKS.

The Jacksonville, Fla., docks of the Merchants and Miners' Transportation Company, are to be equipped with electric platform trucks to facilitate loading and unloading the steamers of the coastwise line. The purchase of the trucks had been contemplated for some time, but had been delayed by lack of charging facilities. A motor generator set has been installed and will now furnish the direct current necessary to operate the vehicles.

SALESMEN RELIEVE FARMERS.

A decidedly novel idea in selling automobiles to farmers was recently put into operation by western salesmen of the United States Motor Company. Farmers in the spring of the year are too busy plowing and doing other farm work to have time to talk to salesmen, so one enterprising man evolved the idea of carrying a farm hand or two to relieve the farmer while he looked over the car and took a demonstration. The scheme seems to have met with success, the farmers being willing to talk automobile when they knew that their work was not being delayed.

ALLIANCE GETS ELECTRIC PATROL.

Alliance, O., has purchased a new electric patrol wagon and ambulance, and it has already proved its worth and advantages over the horse vehicle formerly used. It runs much quieter and smoother as well as faster, and several fast runs have been made from the scenes of accidents to the hospital.

LONDON'S 'BUSES MAKE MONEY.

According to news from London, the General Omnibus Company there collects fares aggregating $250,000 a week, which is $50,000 more than the receipts of the tubes which were planned to secure the bulk of the traffic. Over $60,000,000 was spent on these tubes by the county council, while the omnibus company is capitalized at only $12,500,000.

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BRIEF NEWS OF MANUFACTURER AND THE TRADE

The Perfection Spring Company, Cleveland, O., has placed E. F. Lake in charge of its laboratory.

A. D. Frost has been appointed manager of the New York branch of the American Locomotive Company, recently established.

The Mack Bros. Motor Car Company, Allentown, Penn., has purchased six acres of land adjoining the plant and will erect an addition.

The Gessler Williams Tire Company, Denver, Col., has taken the agency for the Swinehart tire, made by the Swinehart Tire & Rubber Company, Akron, O.

The Roby Carburetor Company has been incorporated in Indianapolis, Ind., with a capital of $10,000 by F. S. Roby, C. J. Schuh and E. D. Salisbury.

The Harder Auto Truck Company of Chicago has secured F. J. Posta as sales manager. He was formerly with the Kissel Motor Car Company in Chicago.

Edward J. Gallien, Jr., has been appointed assistant to the president, and auditor of the Pierce-Arrow Motor Car Company, Buffalo, N. Y., maker of Pierce-Arrow cars.

The Gewinner Company, Atlanta, Ga., has moved into new quarters at the corner of Harris and Peachtree streets, occupying two floors of a new building which was recently erected.

The Krupp Motor Company, Pittsburg, Penn., has purchased ground near Beaver Falls, and is to erect a factory for the manufacture of pleasure and commercial cars.

The Salem Oil & Grease Company is a new organization in Salem, Mass., with capital of $25,000. Incorporators, A. H. Rowbotham, H. T. N. Smith, W. H. Rowbotham.

The Ross Gear & Tool Company, making truck steering gears in Lafayette, Ind., is to erect a new factory on North Eighth street, with 50,000 square feet of floor.

The Hercules Truck Company has been incorporated in Alexandria, Va., with a capital of $100,000. Incorporators, S. W. Woodward, O. Ducker, E. S. Parker, B. W. Parker.

The Mather Spring Company, Toledo, O., has appointed G. H. Brown as sales manager, with headquarters in Detroit. Mr. Brown was formerly with the Standard Sales Company.

The Motor Wagon Company of New Jersey has been organized in Newark, N. J., to take the agency for the Detroit Electric delivery wagon and the White Star gasoline truck.

The Standard Motor Car Company, Dayton, O., has secured the agency for Lippard-Stewart trucks in Dayton and adjacent territory. The concern also handles the Hudson pleasure line.

H. A. Worman, formerly with the National Carbon Company, Cleveland, O., as advertising manager, has joined the Baker Motor Vehicle Company, of the same city, in a similar capacity.

H. R. Pfeiffer of York, Penn., who has the agency for the Baker electric in York, Lancaster and Adams counties, has added Dauphin county to his territory and opened a garage in Harrisburg.

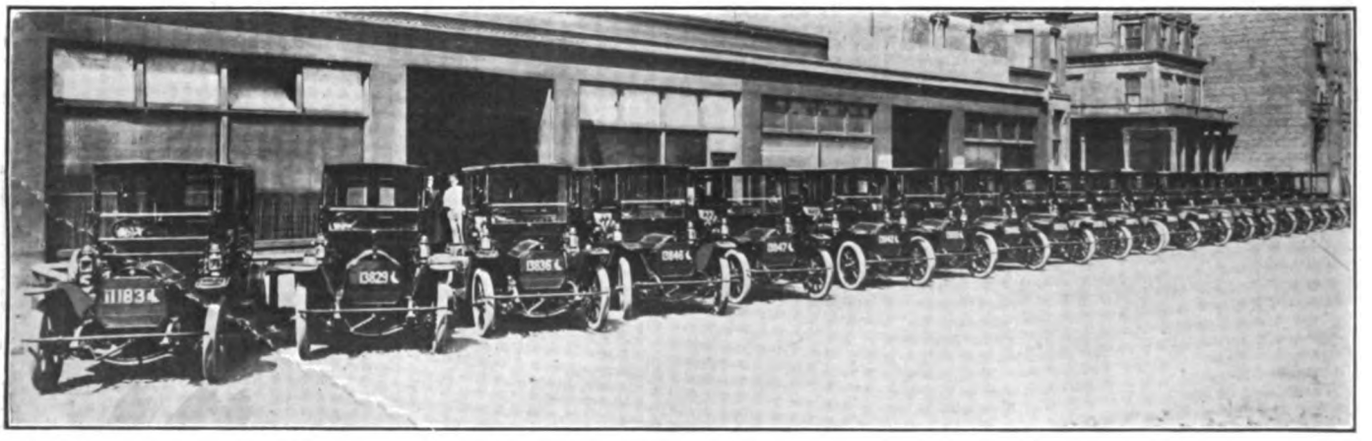
The Miller Carburetor Company, Los Angeles, Cal., has decided to move to the Middle West, and has taken temporary quarters in Indianapolis, Ind., where the company will be closer to the industry.

The Steckle Motor Truck Company, 1414 Ridge avenue, Philadelphia, has taken the agency of the B. O. E. trucks and Lincoln light delivery wagon for eastern Pennsylvania and southern New Jersey.

D. F. Poyer & Co., maker of Menominee trucks in Menominee, Mich., has purchased the Gram factory buildings, the present equipment being too small. During the coming year a total of 300 cars is to be made.

The Hartford Suspension Company, Jersey City, N. J., is shortly to place on the market a new spark plug. No details of the plug have been made public, but it is stated that it will be of the two-piece type.

New agents for the Adams trucks, made by the Adams Bros. Company, Findlay, O., have been appointed as follows: Electric Service & Repair Company, Duluth, Minn.; Central Automobile Company, Albany, N. Y.; Hoagland-Thayer, Inc., Newark, N. J.; L. G. Schoepflin Company, Buffalo, N. Y.; Milton G. Smith Auto Company, South Bend, Ind.; Commercial Auto & Repair Company, San Antonio, Tex.; Waco Auto Company, Waco, Tex.



Fleet of Garford Taxicabs Operated by the Frank Parmelee Company in Chicago.

The Patterson Automobile Company, Hamilton, Can., recently moved into a new garage at 680 King street. The establishment has storage room for 20 cars, and a complete repair department and machine shop.

The Dowagiac Motor Car Company, Dowagiac, Mich., has been taken over by the Tulsa Automobile & Manufacturing Company, Tulsa, Okla. Trucks in capacities of one-half ton, one ton and two tons are to be manufactured in Tulsa.

The Frank Parmelee Company, Chicago, which has the best taxicab business in that city, purchased 60 Garford machines during the past year. The step was impelled by the discovery that the competitors of the company were buying up all the second hand Garford cars they could get and placing taxicab bodies on them, the old cars giving excellent service. Mr. Parmelee had had considerable trouble with his machines, and decided to try the Garford, purchasing a few machines at first and adding the others from time to time.

The International Motor Company, maker of Mack trucks in Allentown, Penn., has established a branch salesroom in

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Cleveland, O., at 1620 Walnut avenue. The Buffalo, N. Y. branch of the company has been moved to 1259 Main street.

The Kadix Newark Motor Truck Company has been incorporated in East Orange, N. J., and will manufacture motor trucks. The company is capitalized at $200,000, and is composed of D. Lester Dann, G. F. Kallberg and Russell M. Colburn.

The Hagstrom Bros. Manufacturing Company, Lindsborg, Kan., announces the addition of a new department for the manufacture of dies, tools, special machinery, etc., for the purpose of making the numerous specialties produced by the company.

The Teel Manufacturing Company, Medford, Mass., which has been making the Teel-Woodworth truck and had announced a new one-ton truck to complete its line, has abandoned the latter project and is to take the agency for the Federal truck instead.

A. R. Mosler & Co. has moved to new quarters at Webster and Wakefield avenues, Yonkers, N. Y., where the new factory and office buildings give more space and greater facilities. The factory is in a pleasant environment and is equipped with the most modern machinery.

The Magna Bros. Automobile Company, Holyoke, Mass., is to occupy the whole of the building in which its garage is located, at the corner of Division and Railroad streets. The second floor is to be taken over and used partly as a showroom and partly for storage.

The Motz Tire & Rubber Company, Akron, O., has opened a branch in Cleveland, O., in order to take care of its rapidly growing business in that city. C. R. Serfoss is in charge, and the agency will take care of the installation of the well known Motz cushion tires for Cleveland motorists.

George Giroux, manager of the truck sales department of the Chicago Pneumatic Tool Company, Chicago, has resigned to become manager of the Foraker Motor Truck Company, which is the Chicago agency for the Durable Dayton vehicle, made by the Dayton Auto Truck Company, Dayton, O.

The Fisk Rubber Company, New York City, recently opened new Pacific Coast headquarters in San Francisco, on Van Ness avenue. The building is two stories high, of reinforced concrete, and contains, besides the salesrooms and offices a complete service department for repairs and vulcanizing.

The Kilgore Manufacturing Company, Boston, has moved into larger quarters at 883 Boylston street. The Air shock absorber which the company produces has been improved and may be had in a number of finishes to match any car, and is now being manufactured in large sizes especially for trucks.

E. L. Adams and W. P. Price have formed the Adams-Price Automobile Company at Atlanta, Ga, and will handle the Grabowsky line of commercial vehicles, made by the Grabowsky Power Wagon Company, Detroit. Quarters have been secured on Peachtree street, where show rooms and a service station will be maintained.

The Poss Motor Company, Detroit, has opened a New England connection under the name of the Poss Motor Company of New England at 121 Massachusetts avenue, Boston, in order to give better service to customers. Arrangements are being made for a first class service depot where a full line of parts will be carried.

The Hyatt Roller Bearing Company, Detroit, has issued in booklet form reproductions of its advertisements and is distributing the booklets to the sales and advertising managers of the automobile concerns handling cars equipped with Hyatt roller bearings in order to furnish them with selling arguments.

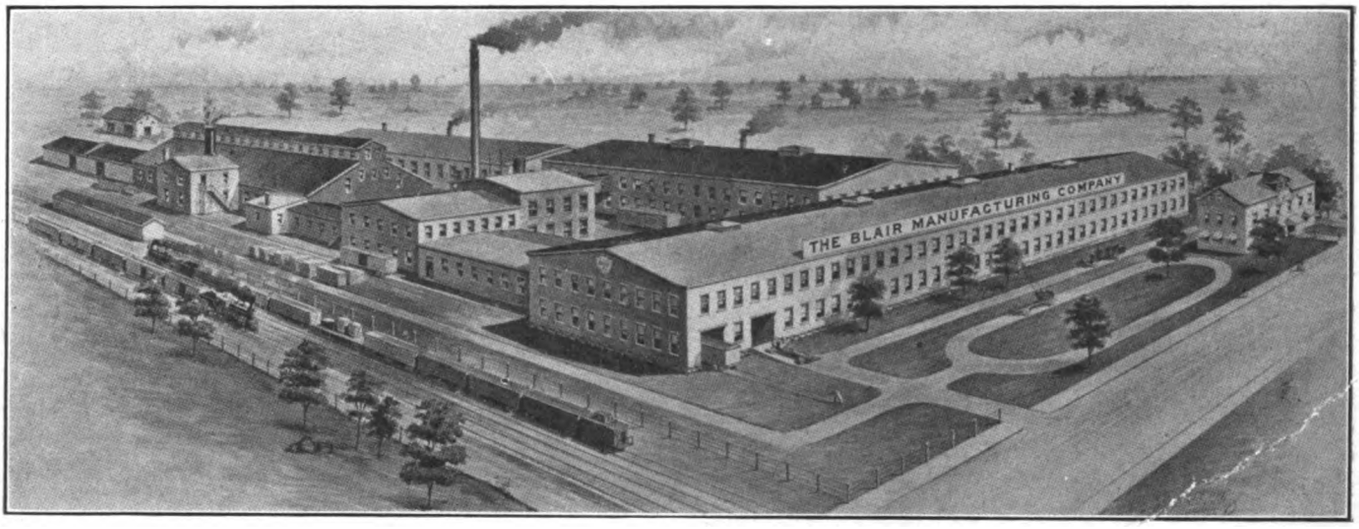
W. F. Reynolds has recently become sales manager of the Lippard-Stewart Motor Car Company of Buffalo, N. Y. He is well known to the automobile industry, having taken over the automobile business of John Wanamaker of Philadelphia in the fall of 1905, and since then has been prominently identified with the industry.

Harry J. Kearns, formerly assistant to Berry Rockwell, advertising manager of the Maxwell-Briscoe Motor Company, has become advertising manager of the Ajax-Grieb Rubber Company, Trenton, N. J., which concern has an office in New York City at 1796 Broadway.

The Four Wheel Drive Automobile Company, Clintonville, Wis., making the Zachow-Besserdich Four Wheel Drive pleasure and commercial cars, has found its present location inadequate and is looking for a location for a new plant. It seems probable that Appleton, Wis., will be selected, as a number of residents of that town are interested in the company.

The Firestone Tire & Rubber Company, Akron, O., is issuing a new booklet illustrating the important features of the Firestone quick detachable demountable rim. The brochure calls particular attention to the fact that the base of the rim is unbroken, either across or around it, also that the inner tubes may be changed when the rim is either on or off the wheel.

The Kissel Motor Car Company, Hartford, Wis., has leased a large four-story building in Chicago, at the corner of 26th and Wabash avenues, and now occupies nearly 100,000 square feet of floor space, the largest devoted to the automobile business in the city. The building has been turned into a model service station.



Factory of the Blair Manufacturing Company, Newark, O., Where the Blair Direct Drive Truck, a Worm Driven Vehicle, Is Made.

The Olds Motor Works, Lansing, Mich., has leased a lot in Boston, at Commonwealth avenue and Hinsdale street, where a factory branch is to be erected. Salesrooms, offices and a service department will be operated. The building is to be of reinforced concrete, four stories high and will have a floor area of 30,000 square feet.

The Billings & Spencer Company, Hartford, Conn., has discontinued by mutual consent the selling arrangements with the Claire L. Barnes Company of Chicago, and will market its line of tools and forgings direct. The Billings & Spencer Company has more than doubled its capacity in the last two years and now has its new plant at Dividend, Conn., in full operation.

The Blair Manufacturing Company, Newark, O., is now installed in its new factory and actively at work turning out the Blair direct drive truck. The factory is equipped in the most modern fashion, with every manufacturing facility for making the worm driven vehicle which the company is featuring. Several novel and interesting features are to be found in the machine, which is made in 1.5, 2.5 and 3.5-ton models.

The Grand Rapids Motor Truck Company, Grand Rapids, Mich., which produces the Decatur Hoosier Limited models has opened a direct factory branch in Philadelphia at 210-212 North 13th street, where a sales department and service station will be maintained under the management of D. Earl Brackett. This is in line with the policy of the new company, which contemplates locating branches of this nature in all sections of the country.

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The MOTOR TRUCK
Devoted to Motor Driven Business Vehicles of All Classes.

VOL. III. PAWTUCKET, R. I., JULY, 1912 No. 7

TRUCK EFFICIENCY IN LONG, HEAVY HAULS.

Practical Results with G. M. C. Machines in Delivery Service of Construction Material Dealers, Wholesale Sugar House and Furniture Mover—Jobbing Truckmen Have Abundant Work and Are Well Paid for Their Enterprise.

EVERY business man feels that he cannot be guided by the experiences of others. He assumes and generally justly, that what may be profitable with others may be unprofitable with him, and as expense is the main factor to be considered in conducting any enterprise he is desirous of demonstrating to his own satisfaction what may be accomplished with a method or system under his administration. While he would not hesitate to undertake the distribution of an article or commodity, or to seek custom where competition would mean the smallest margins, or to invest capital in a business that must be developed and is largely if not wholly experimental, he is not willing to trust his judgment fully when the proposition is greater economy in a direction where he is practically certain there can be a saving. It is not too broad a statement to say that with rare exceptions animal haulage is practically without system insofar as it relates to custom. To illustrate, theoretically there should be a standard price established for any product at the place of manufacture or distribution, and there should be a charge for delivery based on the actual cost of maintenance of the delivery. As a matter of fact the prices of the department store, for instance, are established on a different basis, and there is no difference in the selling value whether the product be delivered or carried away by the customer. This generally accepted rule may be varied under some circumstances, but with rare exceptions, within what is regarded as a reasonable distance, the charge is the same.



The G. M. C. 3.5-Ton Truck in the Service of the William Curtis & Sons Company, Lumber Dealer, Boston, Mass.

Where products are purchased in quantities and shipped considerable distances the purchaser pays the freight or express charges, but immediately when placed on sale a flat rate is made and community distribution is made without regard to the quantity or the distance carried in delivery. There are commodities, however, of considerable weight and bulk, where there is a "yard," "wharf" or "terminal" price, such as coal, lumber, building materials, and in some instances prices are made at the warehouse, but these are not generally known. With coal the custom is to make a "yard" price and a regular delivery charge is made within a specified zone. Beyond this there may be other zones and different prices. Considering other commodities, such as lumber, there is a yard price for large purchases and delivery is included in the prices established.

This works out something like this: The customer pays in addition to the initial charge whatever the estimated cost of delivery may be. This delivery price may be large, in the event of no competition; it may be small because of competitive selling. There is no actual basis by which a charge is made with weight and distance as the determining factors, and beyond all this is the fact that the haulage expense to the sellers is always different. Undoubtedly there is no standard for delivery expense. Much depends upon the administration and methods and whether the service may be regarded as high class or otherwise. It is not an extreme to state that this variance may be as much as 20 per cent. in some cases. So instead of paying a price that will yield a reasonable margin of profit on the actual expense the customer may, through competition, force the

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seller to deliver to him at what is actually a loss.

There is another factor that may as well be considered. Assume a lumber dealer in a large city. He has a trade that may be extended a considerable distance, but in increasing the territory he would serve he finds that the cost of delivery is correspondingly increased, and that he is in competition with others who may have their shipments differently made, and the initial cost may be greater, but this is offset by the lessened delivery expense. There is, then, a point where it is not profitable for the dealer to seek business unless he can economize in his delivery. Obviously the long haul is the most productive because of the minimizing of lost time of the vehicle and the men attending it, but there is at the other hand the unproductive mileage, which cannot be made productive unless through taking up work of another or dissimilar character, which is hardly to be considered.

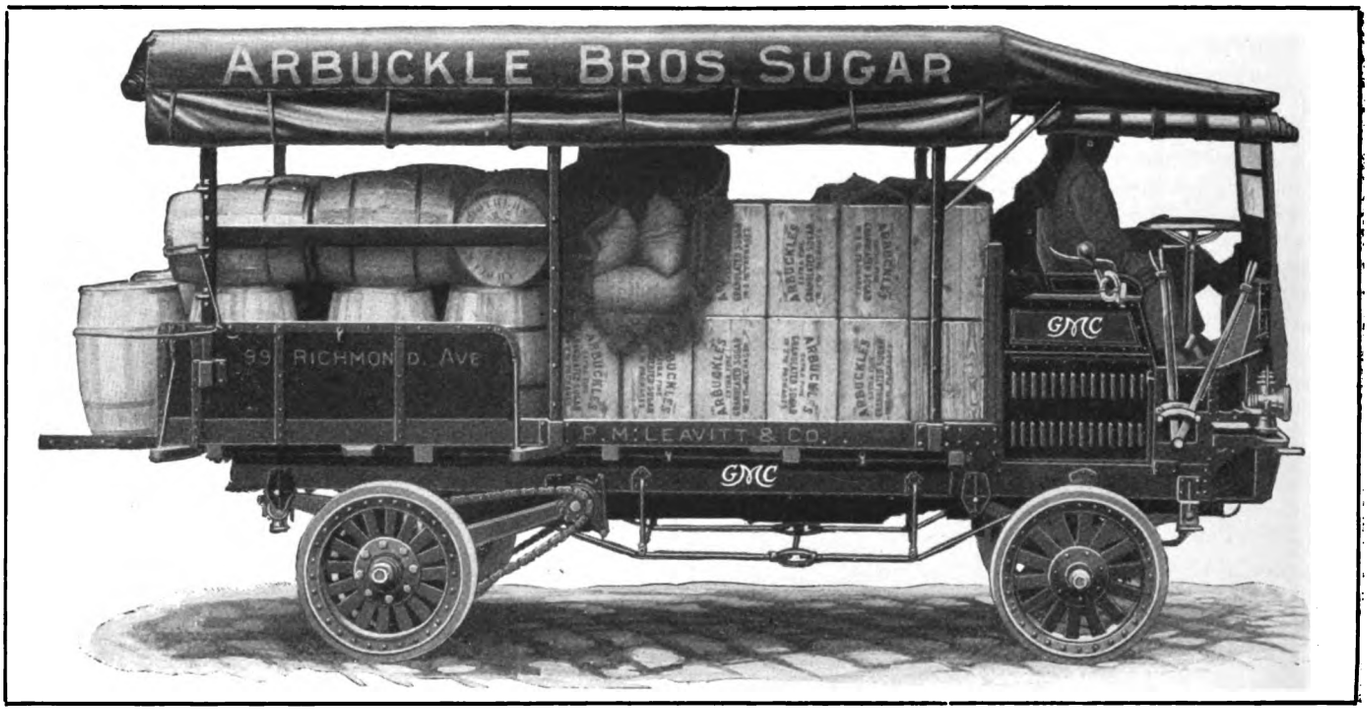
It is apparent enough that the cost of delivery can only be decreased by increasing the loads and the time required to haul them, and by minimizing the time of loading and unloading. In this statement it will be noted that animal delivery is the measure by which any other form is judged. But with rare exceptions there is no actual knowledge by which horse cost is established. This does not mean that business men are not possessed of intelligence, but it does mean that haulage expense was or is seldom kept; that instead of real figures of each business a rough approximation has been reached; that this assumed standard may be relatively high or low; that the estimate does not represent possibilities so far as administration of animal service is concerned, and it is certainly not the last word when the application of labor saving and cost reducing methods are to be considered.

In fact it may be said that most of the business men can only guess at horse delivery cost. But even the most carefully prepared statements are of no real value unless they deal specifically with the businesses they are applied to, because in no other way can exact knowledge be obtained. Then there is the estimate of horse delivery cost that might be applied to a coal business, for instance, regarded as the comparative measure for a wholesale grocery firm, or vice versa. Obviously this is all wrong.

When another form of vehicle is employed the estimate of horse delivery is unchanged and the method or system of delivery is varied but little, as a rule. This is because the attention that should be given to haulage is not given, and because it is assumed that superior speed and capacity will be productive of economy, when as a matter of fact these qualities are not realized because no change is made in the method of service.

There are numerous instances of business men having a desire to better their delivery taking a single motor vehicle and utilizing this with their animal service, and making more or less experimentation with a view of determining the relative cost of the two forms of transports. While there is the somewhat uncertain expense of the horses at the one hand, it must be admitted that proportionately a number of service wagons could be more economically maintained than one. Not only this, but with increased experience that there ought to be better service at a relatively lessened cost.

A number of decidedly interesting trials of G. M. C. trucks are now being made in Boston by firms that are engaged in differing lines of haulage, and of these four are with machines of 7000 pounds capacity, and another is with a 10,000-pound truck. These vehicles are all of the Reliance type, which name has been supplanted by that of G. M. C., and have been in service for differing periods of time, from eight months to two years, while there is another use of two trucks which appear to be pioneers in a service that has seemingly large possibilities. In connection with the work performed by these machines it will be necessary to state conditions under which they are used, and also facts relating to haulage generally in Boston.



G. M. C. Five-Ton Truck Serving the Suburban Customers of P. M. Leavitt & Co., Boston, Being Driven at Least 50 Miles Daily to Deliver Seven Tons of Sugar.

First of all there is a generally accepted standard of $6 as the daily cost of hiring a team of average horses, a cart or heavy wagon and a driver. That is to say, there are contractors who will furnish the outfit stated for the price given, and assumedly this means with a reasonable profit. However, this is accepted as the probable basis of haulage. The cost of a four-horse team would be at least $8 a day, and perhaps more. The hired truck and team would no doubt be worked to the limit, which might be regarded as from 16 to 18 miles a day. The single purpose is to obtain

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all that is possible for the money, and means that there is hardly the consideration for the animals that would be manifested were they the property of the concern hiring them. It is reasonable to assume that maximum haulage is secured so far as is possible with the methods the vogue. Were each delivery wagon loaded but once each day and sent to its destination, as far as the haul could be made, this would be ideal but with the frequent short hauls a large part of the time is taken up in loading and unloading and in traffic delays, so the mileage is considerably reduced when averaged.

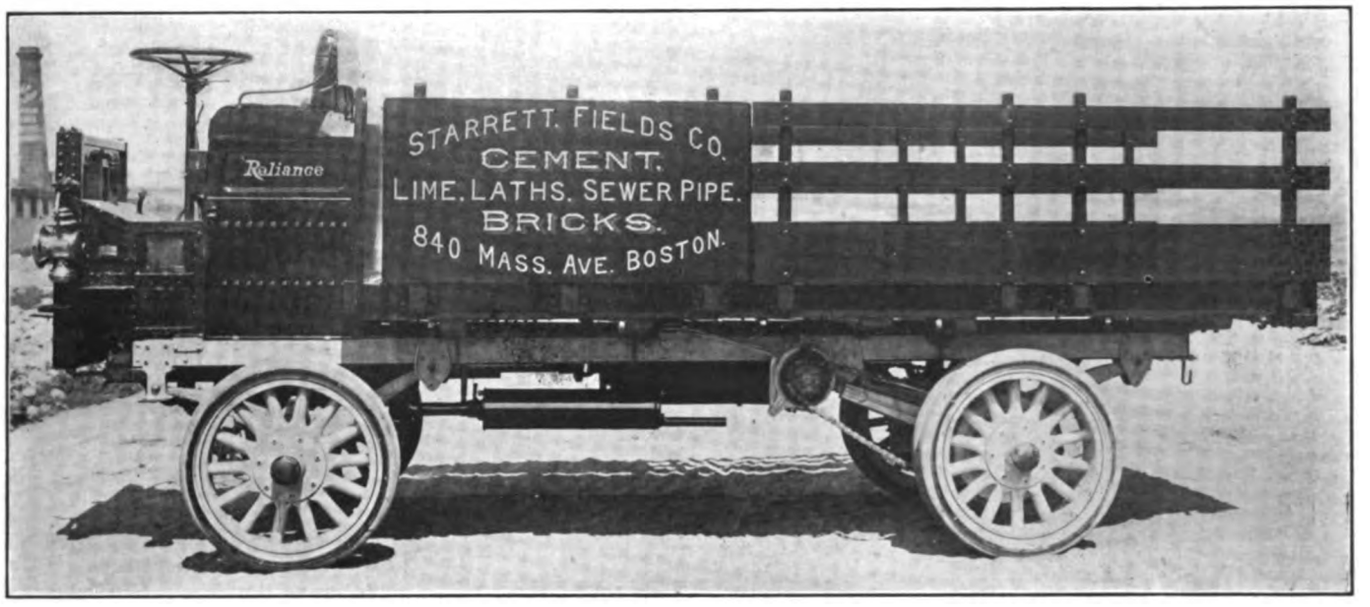
With two of these examples it should be said that there is the "yard price" for material, the one being lumber and the other masons' materials, to which is added the estimates for the cost of delivery. Two others deal with extended delivery service, and two others with the special work to which attention has been directed.

Of these the business of William Curtis & Sons Company, 30 Eustis street, Roxbury, may be said to have had the most experience with a truck, as it has used a 3.5-ton Reliance machine for rather more than two years. This concern sells lumber of all kinds and it has in its service about a dozen two-horse teams and the usual carts and lumber reaches. The motor truck is used for a work where it is expected to yield the best returns—all the long hauls—and when it is not so employed it is selected for whatever haulage it is believed to be best adapted. There are limits to the length of stock that can be carried, but so far as is possible it is utilized.

The chassis has a platform body or deck with forward side boards and side stakes. At the rear of the platform is an iron roll carried on brackets so that the upper surface is perhaps two inches above the deck. In the original construction there was a somewhat smaller roll mounted at the middle of the deck on brackets at either side. The rear roll carries a gear and ratchet lever at the left side. On the same side are two cranks and handles, with ratchets for tightening the chains by which the load is bound to the truck, one at each end of the body. These rolls and the ratchets, the levers and the cranks, are all simple and the cost is comparatively small.

As a means of economizing time of the truck at the yard a "dead wagon" is used. This has a deck equipped with iron rolls and ratchet lever and gear, as is the truck, and on this "wagon" a load is piled exactly as it is intended that it shall be carried. The truck is backed to the "wagon" and under the end of the load of lumber, the truck being slightly lower than the other. With the lever the forward roll is turned and the load is transferred to the truck, it moving easily on the rolls from the one deck to the other. Despite the weight the load can be taken on the truck in two or three minutes, and then the chains are tightened and the truck is ready for the road. Since the original construction the iron rolls save that at the rear have been removed from the truck deck, because of the sag of the end of the load, and maple rollers have been used that may be placed wherever they may be used to the best advantage.

When the load is delivered the truck is backed to the place where the lumber is to be deposited and with the ratchet lever it is drawn backward and dropped to the ground or onto horses or other supports. Then the machine can be driven back to the yard and the process repeated, so long as there is room available for this manner of unloading. Just what proportion of the unloading with the means described is practicable is not stated. The company has kept a reasonably accurate record of the services realized from the truck, but it is not prepared to make these public. Other than that the vehicle has been doing good work for the purposes utilized no statement has been made.



Three and a Half-Ton G. M. C. Truck Making the Long Distance Delivery of Starrett, Fields Company, Building Materials, Boston, Mass.

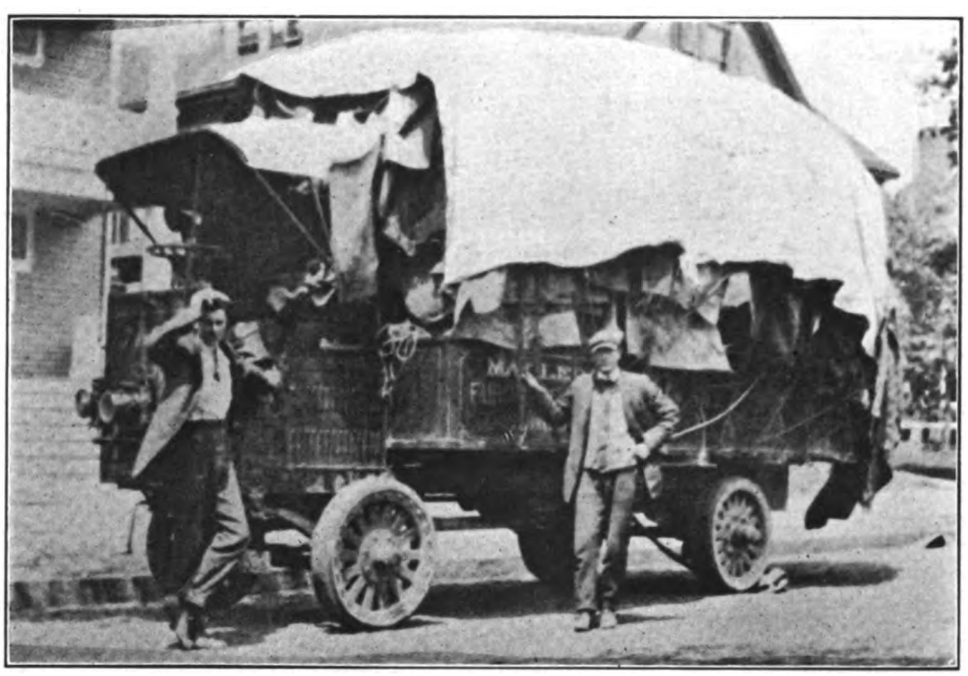
The Starrett, Fields Company, on Massachusetts avenue, dealer in masons' materials, chiefly brick, lime and cement, does a business with customers scattered all over Boston and its suburbs. The weather is more or less of a factor in its distribution and under some circumstances deliveries are made daily during the continuance of a job, instead of making delivery as quickly as possible. There are all sorts of conditions governing the distribution and it is not possible to greatly change these. The hauls are all distances within a radius of 25 miles, this distance being the extreme and trips of this length are not often made. It is a fact, however, that deliveries could not be made beyond 10 miles with horses, unless at great expense, but it is characteristic of the motor vehicle that the longer the haul the more economically it can be made, up to the point when the steam railroad becomes a factor.

This may be demonstrated by instancing one trip made by this truck to Marblehead Neck with a load of lime, cement and brick, the weight approximating four tons. The run was made by the driver alone and the time was 4.5

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hours, including the time taken for unloading the truck. As the brick were handled by hand it can be understood that a half-hour was not too long an estimate. This gave four hours on the road. The longest distance the truck has been driven in any one day is 89 miles, and this included one trip to Andover, Mass., which is approximately 52 miles. The average work of the truck daily is 45 to 50 miles, and during the 19 months it has been used it has been driven close to 27,000 miles. The fuel consumption is about six miles to a gallon and about three pints of cylinder oil are used daily, while about eight quarts of transmission oil are used each month. This gives roughly an idea of the fuel and lubricant expense.

In reference to the work of trucks Mr. Field of this firm says that his observation is that with deliveries within five miles the truck will take the place of two two-horse teams, within 10 miles the place of three two-horse teams, and beyond that radius it will take the place of "any number of horses." It should be remembered, however, that there is no special provision made for loading and that the freight must be handled at either end by the driver and his helper, for often two men are sent with the machine. Mr. Field's estimate is made on the basis of horse cost figured at $6 a day for a team, cart and driver.



The Three-Ton G. M. C. Truck Making Lengthy Trips for Macleod Bros., Piano and Furniture Mover, Brookline, Mass.

The company sells at the "yard prices" and to these is added what may be the estimated delivery expense. Where there are emergency calls and special orders the truck serves a purpose in which expense cannot be computed by the measure already given, for the contractors are often willing to pay an additional price for immediate service, but this kind of work is the exception and not the rule. There is, however, no consideration of the fact that the capacity of the truck is practically the same throughout the year, and that when the horse loads must be reduced because of hot weather or snow, ice or mud, the machine can haul its freight with practically no reduction of capacity and slightly lessened mileage. The truck is used with from 10 to 15 teams of horses and carts.

P. M. Leavitt & Co., 99 Richmond avenue, Boston, is a dealer in sugar, handling Arbuckle products. This concern has about 25 horses in service, and these are used with two and four-horse wagons with which delivery is made. The sugar is received at the New Haven freight houses in Boston and each morning the drivers load their wagons at the railroad terminal. The sugar is received in bags, boxes and barrels and is loaded as best will serve, because there are no special packages. The load for two horses is about three tons and for four horses about seven tons.

The drivers have certain customers to serve and are allowed discretion as to how to make the deliveries in the least time possible. The bags and the boxes may be lifted, but the barrels are handled by skids. Obviously the wagons must be so located when unloading that the work can be done quickly and with the least effort. As delivery is now made a two or four-horse wagon is loaded to make one trip and the load is sent to customers within the distance the team can make without excessive work. This usually takes the entire day, although there are exceptions to this. Last November the company bought a five-ton truck and with it began to serve customers that could not be reached with animal delivery, developing new business.

The company has customers served exclusively by the truck up to points within 20 miles or thereabout of Boston, including Abington, which is 21 miles, Walpole 19 miles, Wakefield 17 miles, and Hingham 17 miles, these distances being roughly estimated and hardly sufficient. The truck, designed for 10,000 pounds capacity, is always started in the morning with a load of 14,000 pounds, and this is distributed along the route by the driver and helper, the average work for the day being about 50 miles. Occasionally this mileage is increased, but it is seldom as much as 60 miles.

The truck was given an exceedingly hard test during last winter because of the severe weather conditions. While it did its work in every way satisfactorily the load it carried was always approximately seven tons, the mileage being lessened somewhat in the event of deep snow. The truck in winter is driven in highways that are seldom cleared of snow, as in the cities, and where the traffic is not always sufficient to give anything like the beaten surfaces to be found in the city and town streets.

It is difficult to make comparison of the work that this machine does with animals, because the conditions of operation are entirely different. It has at least three times the daily mileage of any four-horse team, and yet it carries but one load. That is, it is driven three times the distance to make the same distribution, but it is serving customers who could not be reached in any other manner, and at a relatively smaller cost than they could be served by any other form of delivery.

Of course the greater part of the daily trip the load is not greater than the rated capacity of the vehicle, and it is lightened with every delivery, but regarded from the viewpoint of actual service the machine is doing practically as much, if not more, than any other similar vehicle in service in Boston. The fuel consumption averages a gallon approximately 4.5 miles, which is comparatively low considering the character of work and the load carried.

Another illustration is the work accomplished by the 3.5-ton Reliance truck owned by Macleod Bros., piano and furniture mover, Brookline, Mass. Because of the work engaged in this machine is equipped with an express type

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body made especially for the carriage of furniture. The truck was delivered late last autumn and it has been used by the owners in connection with several horse teams and wagons, but doing a class of work that is much different than might be attempted with animals. For that reason it is not practical to make comparison with the use of horses. The truck has been a number of times sent to Providence and Worcester with furniture, and it has made several trips fully 75 miles from Boston, always going out loaded and returning light.

Macleod Bros. has about 50 customers who move from their winter homes to their shore or country residences for the summer, and as the distances are generally considerable the truck was utilized for haulage this spring with admirable results permitting the firm to give quicker and better service, and consequently greater satisfaction, because the moving must be done within a comparatively short period. The concern books its time for this work months ahead and as a schedule must be made it is essential that it be lived up to. With the truck, trips that could not be made in less than two days are often made in much less than half the time, and as the runs are generally straightaway, and the hauls long, the speed of the vehicle can be utilized to excellent advantage.

The truck is maintained in the firm's garage, and it is driven and practically all of the work on it is done by the two members of the firm. Naturally, while economy is considered and desired, the machine is given careful attention and kept so as to give the highest efficiency.

Of these four machines, those of William Curtis & Sons Company and P. M. Leavitt & Co., are kept at the service station of the General Motors Company, 944 Massachusetts avenue, and the other two are kept in private garages. Under any circumstances it is not to be assumed that the cost of maintenance is as low as it would be had each owner a number of machines and could have his own garage organization. Whatever work is necessary for efficient upkeep of the trucks is generally done by the service department of the General Motors Company.

When the Curtis truck was first placed in service it was driven by G. D. Tierney, and when the Starrett, Fields Company's truck was bought Thomas Coolidge was engaged as driver. Eight months ago these men formed a partnership and bought a 2.5-ton G. M. C. truck and began business as jobbing truckmen. They found all of the work they could handle and did well, but Tierney sold his share to his partner at the end of three months and looking about for a machine found the first Reliance truck that was used in Boston, which, after five years' service, much of the time demonstrating, was believed to be ready for the scrap pile. It was in the G. M. C. service station garage and was not considered of much value. The old two-cycle motor had been replaced by a Continental engine about a year before, and this was considered to be the only valuable part of the vehicle.

Tierney bought the truck, had the broken chassis frame welded, and, doing the work himself, restored it at comparatively small expense. Since that time he has used it constantly, having more work than he and his helper can do, and besides this has opportunities to make contracts for work for an entire season if he desires them. He is often called on to take out special orders for concerns that have their own deliveries, such as the Curtis & Sons Company, the Starrett, Fields Company, and the like, when they have demands that they cannot take care of with their own equipments. He says that he is doing very well and that he is establishing himself, believing that he has the foundation of a good business, and that development is certain.

His method of caring for the truck, which he keeps at the service station of the General Motors Company, is to examine it each day for possible needs of adjustment, to go over it whenever he has any spare time during the day, and to keep it up to as high a standard as he can. He wants the machine to be always ready for use and if night or Sunday work is necessary it is done. As to his driving, he maintains that there is nothing gained by moving fast over poor streets or roads. He says that he drives as he did with horses, favoring the truck where judgment dictates this should be done, and making time on the good streets and highways. He said that the day he was conversing with the writer he could have saved an hour's time by driving over a short section of very rough ground, but he preferred to unload the truck and carry the freight a short distance himself rather than abuse the machine. He says that he will not carry overloads and that in the event of being in sand or soft ground where very severe work is necessary to move or get out of a hole he will use boards, brush or whatever will give the driving wheels traction. Mr. Tierney says that the truck is doing just as good work as any machine in the country, that he will do work not many will undertake, that he will do it quite as quickly, and that the vehicle in service is running as well as any.

After purchasing his partner's interest in the 2.5-ton truck and using that machine for a time Coolidge sold it and bought a used Reliance 3.5-ton truck. He is using this in practically the same sort of service and he is getting satisfactory results, but it is by no means as old as Tierney's.

These two men own their trucks, operate them themselves, employ a helper, and find all the work they can do at prices that are satisfactory. The charge for the trucks is about $2 an hour, according to the nature of the work, and as this includes the services of two men it cannot be regarded as excessive, but very often work is undertaken for a job price, and this cannot be estimated by the hour basis. Jobbing haulage has been carried on with animals for years, but men engaged in this kind of work would seem to regard the ownership of a truck as something quite beyond them. The experience of these two men would seem to indicate there are abundant opportunities for energetic drivers to establish themselves, and to secure constant and desirable patronage from firms that are willing to pay for whatever special service they need, rather than have delivery that might at any time not be utilized to its full capacity.

AUTOMATIC STARTING DEVICE.

L. N. Heebner, superintendent of the fire alarm system in South Manchester, N. H., as well as being foreman of Hose and Ladder Company 1, has conceived a device whereby the engines in the automobile chemical and automobile hook and ladder, which the company recently ordered, will start automatically every time an alarm is received at the hose house.

The invention will necessitate the attachment of a small motor to both engines, and these will be connected with the fire alarm box so that when the alarm is rung in the motor will start and this will in turn start the engines. The connection between the apparatus and alarm box will be so arranged that when the automobiles leave the headquarters the connections will break. The details of the device have not been worked out sufficiently to warrant Mr. Heebner in making them public as yet. He will give it every test before it is placed on the market, but that is his ultimate desire.

The new apparatus, which has been ordered from the Seagrave Company of Columbus, O., is to be delivered in the near future. Both machines will be equipped with 80 horsepower engines, and the hook and ladder truck, because of its length, will have a tiller to steer the rear wheels. The two motor driven vehicles will cost the city of Manchester approximately $12,000.

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BOSTON TRUCK SHOW DATES.

Hand in hand with arrangements for the pleasure vehicle show in Boston, March 8-15, 1913, plans are being made for a motor truck show, March 19-26. The subject was discussed at a recent meeting of the Boston Commercial Motor Vehicle Dealers' Association, when dates were decided upon, and other details outlined. Another meeting will be called in the fall when more definite steps will be taken regarding show trains, decorations and assignment of booths.

SHANKS AGENT FOR KELLY.

Charles B. Shanks of San Francisco, Cal., has taken a position as general factory representative for the Kelly Motor Truck Company, Springfield, O., in California, Oregon, Washington, Idaho, Montana, Nevada, Utah, Arizona, New Mexico and the Hawaiian Islands. Branch quarters are to be established in San Francisco in a building 200 by 200 feet at Fourth and Harrison streets.

In the other sales centres in the territory, Shanks will establish and supervise agencies which will have the active co-operation of a competent factory mechanical staff. Realizing that the sale of motor trucks depends in a large measure on real factory service in matters of skilled mechanics and a complete stock of duplicate parts, the Kelly company is to equip each of its agencies in such manner that delays in making repairs will be reduced to a minimum.



Peerless Car in Service with the Maier Brewing Company at Los Angeles, Cal.

LEE TIRES IN MAIL COLLECTION.

In the fall of 1909 the postmaster at Philadelphia decided to experiment with commercial cars in the collection of mail throughout the city. Four Autocars, made by the Autocar Company, Ardmore, Penn., were placed in service and these have given excellent satisfaction. The four cars replaced 20 horse wagons and 40 men. The tire equipment is of special interest, these 1500-pound wagons being fitted all around with Lee puncture proof 34 by five-inch pneumatic shoes made by the Lee Tire & Rubber Company Conshohocken, Penn. The puncture proof feature has been particularly satisfactory, in view of the need for constant service, eight hours a day.

AGENT FOR LOCOMOBILE TRUCKS.

A. M. Pearson has closed negotiations with the Locomobile Company of America, Bridgeport, Conn., to handle its five-ton truck in Philadelphia, Baltimore and Washington. Mr. Pearson is well known in the motor truck world, having at times been connected with the White Company, Cleveland, O., and the Gramm Motor Truck Company, Lima, O. The Locomobile company has met with remarkable success in the introduction of its latest product.

Speaking of truck conditions in Philadelphia, Mr. Pearson says: "I have always maintained that Philadelphia is the greatest truck field in the United States. The principal reasons for this are the extraordinarily large area covered by Philadelphia proper and the number of small towns surrounding the city."

PEERLESS IN BREWERY DELIVERY.

An accompanying illustration presents a Peerless truck, made by the Peerless Motor Car Company, Cleveland, O., and in service with the Maier Brewing Company in Los Angeles, Cal. The well known efficiency and economy of these vehicles has been ably demonstrated by this installation, and the car has travelled scores of miles over the city streets and roads in that immediate vicinity.

One of the particular features, which has had a bearing on the situation is the matter of weight distribution. As in all Peerless trucks 80 per cent. of the load is carried on the rear driving wheels, making it possible to utilize light, flexible and easy riding springs in front. These are held to preserve the mechanism from the destructive jolts that would not be dissipated in another manner.

Careful examination of the photograph will reveal a little dog, Fritz, seated on the hood. Perhaps Fritz may be regarded as the mascot of this particular truck. He occupies this position throughout the entire day's work. Before the arrival of the Peerless, he was in the habit of following one of the horse teams, and seems to have realized in no small measure that the mechanical transport is eventually to replace the animal equipment.

G. M. C. DELIVERS ASPHALT.

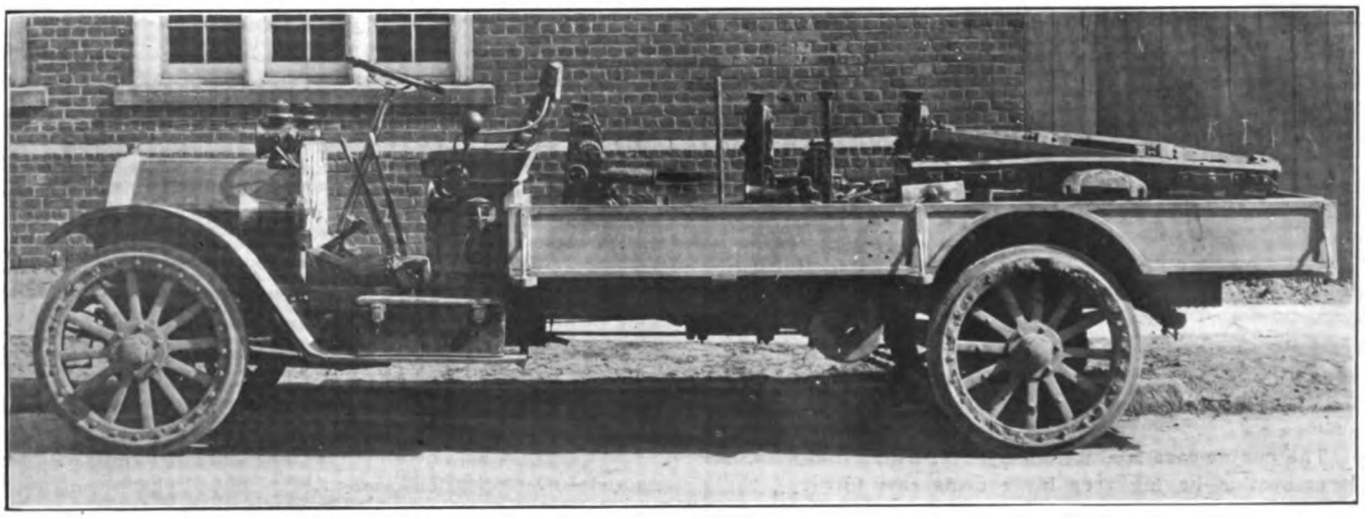
Detroit has been using a G. M. C. truck, equipped with a special mechanical dumping body, made by the General Motors Truck Company of that city, in laying asphalt during the past few weeks. The experiments with the machine have proved that the unloading not only can be accomplished more quickly, but the rapidity with which deliveries are made enables the workmen to spread the material while hot, thereby improving the surface of the pavement. Recently work was done 3.2 miles from the asphalt plant. The truck made a trip every 55 minutes, carrying five tons of asphalt, sufficient to spread over an area of 70 square yards. Eight trips a day were made, 42 tons of asphalt being delivered. The daily distance covered was over 50 miles. With horses, aside from the other disadvantages, each team could make only three trips a day, delivering a total of nine tons of the material.

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THE FEDERAL ONE-TON TRUCK.

THE Federal Motor Truck Company, Detroit, Mich., produces a single type of vehicle, this being of one ton capacity, the chassis being suited for differing body installations. The policy of the company is that in the production of but one machine, and every endeavor directed toward the perfection of this, there are numerous advantages from the viewpoints of manufacturer and user. To illustrate: The factory equipment was installed with the purpose of concentration on the machine, this specialization reducing the manufacturing cost materially and permitting undivided attention toward the development of the vehicle.

It is held by the officials of the company that the design was decided upon after it had been carefully experimented and every desired quality had been obtained. The preliminary work was with a view of determining every fault and when every practical requirement had been established and every element had been found equal to the service for which such a wagon is adapted, production was begun. In other words, instead of similar work with several designs and the necessity of costly machine equipment for each, no matter how many were built, it was believed that there was a sufficient demand to justify the one-ton wagon and to standardize this, improving it whenever exhaustive experiment had proven that this was practicable.



Federal Truck Equipped as Wrecker and Fire Attending Apparatus by the Detroit United Railway, Carrying Jacks, Tools and Hose Jumpers Weighing 2100 Pounds.

In considering the possibilities of the market for motor vehicles it was decided that the greater number used are of comparatively small capacities and that these are utilized for a great number of purposes. What was essential was mobility that would permit rapid delivery, sufficient loading capacity to take a full freight of light but bulky commodities, and construction that would endure under all reasonable road conditions. Of course there is a limitation as to speed that is practical when the road surfaces are considered, and yet there must be ample power for use over poor highways. The chief value of a motor delivery is its capacity to carry a load as rapidly as circumstances will permit, and to return as quickly as is possible, because time must be allowed for loading and unloading, and the economy of time must be while on the road.

In a construction intended to perform such service as has been stated there must be careful attention to design, because of the extreme work that must be accomplished, and there must be an ample factor of safety with relation to each component of the entire assembly. Not only this, there must be interchangeability of parts, and it is equally desirable that these be as low in cost as is consistent because of the need of economical upkeep and maintenance. It is maintained by the company that by limiting the design to one vehicle and producing in large numbers the highest ideal is reached in manufacturing, and this economy makes possible the marketing of a machine that is not only superior, but relatively cheaper, than that constructed under other conditions.

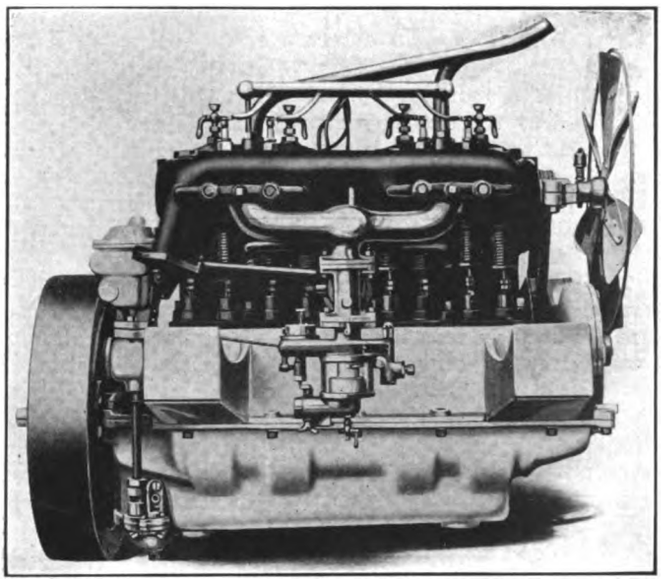
The selling policy of the company is to economize distribution so far as this may be done and to not only convince the business man that motor delivery is practical, but to make clear that the main proposition for him to deal with is what form of equipment will afford him the most efficient and satisfactory service. The machines are placed in the market with a guarantee for one year, but this guarantee ceases with breaking of the seals placed on the governor of the engine when the vehicle is finally inspected and shipped from the factory.

The Federal wagons are made with two types of chassis, the model C being 110 inches wheelbase, and the model D 144 inches wheelbase, the difference being in the longer chassis frame of the latter. The model C is intended for carrying smaller freights of comparatively heavy commodities, and the model D is designed for the loads of bulkier articles. For these chassis two sizes of body are fitted as standard installation when such equipment is desired, the model C stake body having a deck 101 inches length and 62 inches width, and the model D stake body a deck length of 144 inches and 62 inches width. The express body of the model C is 101 inches length and 46 inches width, and the same type of body for the model D chassis is 126 inches length and 46 inches width. The stake bodies have respective deck areas of 43.67 and 62 square feet, and the express bodies areas of 32.25 and 40.25 square feet, respectively. Reference is made to the variance of body equipment because the chassis may be bought that is best suited for a specific purpose, and this permits choice that is not possible where there is a single size.

The Federal service wagon is a substantial construction but one of the reasons for its endurance and speed is the fact that it is so constructed that it may be driven to its limit without excessive stresses upon the mechanism. The chassis has abundant power, the motor being rated at 28.9 by the S. A. E. standard which is a horsepower much larger than is found in vehicles of considerably greater load capacity.

The motor is of the L head type with the valves at the

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Right, or Camshaft, Side of the 28.9 Horsepower Motor of the Federal Truck.

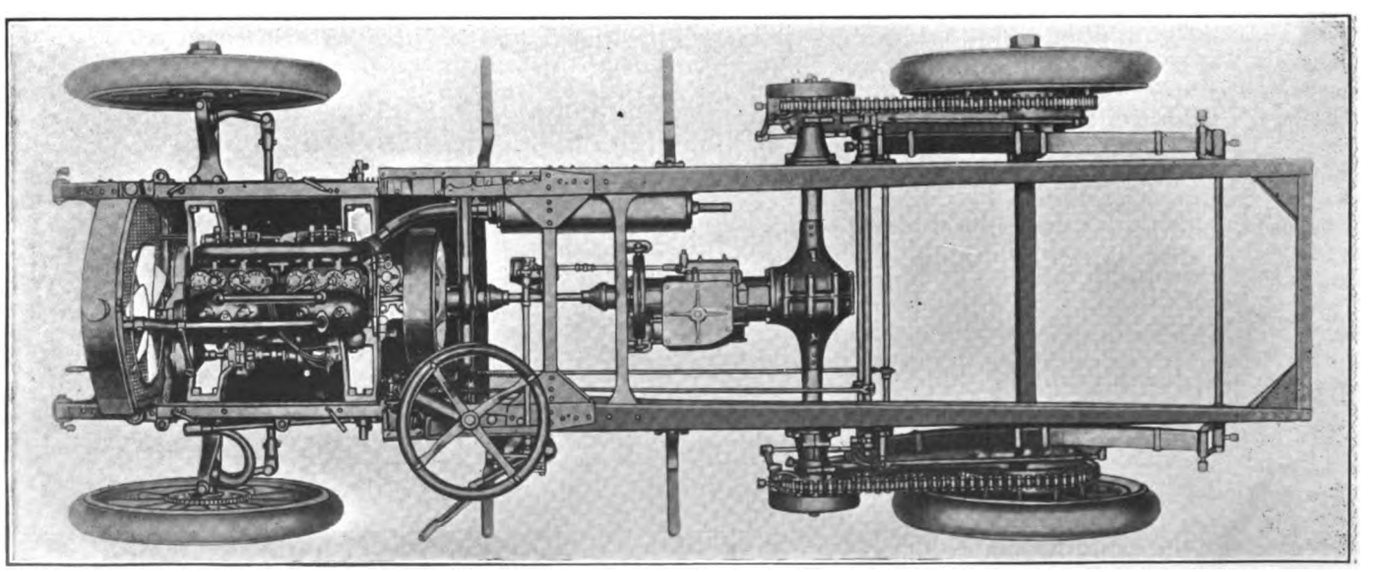
right side, the bore being 4.25 by 4.5 inches. The cylinders are cast in pairs, the units being of a fine quality of gray iron, with the water jackets integral. The water jackets are large and are formed to afford a free circulation of the cooling fluid. The bosses for the compression relief and priming cocks are located in the centre of each cylinder and the large exhaust header is retained to the cylinder units by heavy bolts anchored in the sides of the castings. The base flanges of the units are very heavy and are reinforced by substantial bosses for the bolts retaining them to the crankcases.

The cylinder castings are carefully cleaned of the cores and are then bored and reamed, and after ageing are ground to size. The pistons are cast of the same material as the cylinders and are turned and accurately fitted by grinding being channeled for four rings. The rings are ground on the edges and the peripheries so that the compression is positive.

The engine case is aluminum, divided longitudinally, the upper section having very large arms cast integral, these being cored for lightness and having unusual supporting area. The outer sections of these four arms are designed to fit in to the chassis frame, affording a bearing surface that is ample from every point of view. Cast with this section is the bracket at the left side that supports the magneto. The forward end of the upper half is extended beyond the forward end web and this extension houses the timing gears, a plate bolted to the housing covering the shafts and gearing. The lower half of the case is cast with a web above the bottom, in which are the channels for the swing of the connecting rods, these forming the pits in which the lubricant is accumulated. The shape of the section is such that the channels appear in the sides and the effect is a strength that might ordinarily be secured through bridge work. Below the web is the oil reservoir, which is slightly deeper at the rear, so that there is a drainage to the rear of the case, and two large inspection openings, one at the extreme rear of the left side and the other at the bottom on the same side permit easy cleaning of the reservoir. The upper section carries the main bearings and the lower half may be removed without disturbing these should it be necessary to work on the crankshaft or connecting rod bearings.

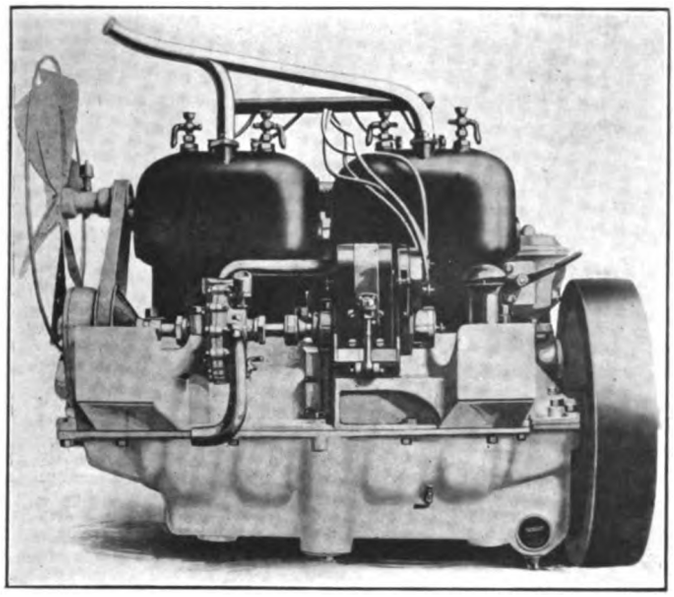
The crankshaft is a special alloy steel drop forging and it is carefully heat treated and ground to size, the shaft and crankpins being of large diameter. The shaft is installed on three unusually long bearings of die cast metal, these being adjustable with shims, carried in the end and centre webs of the case. The crankshaft and the bearings are designed with a view of endurance under severe and continuous service. The connecting rods are I section steel drop forgings of large size, and these are fitted to the crankpins with heavy caps securely bolted, with shims for adjustment for wear. The small ends are fitted to the wristpins, which are of selected steel, hardened and ground to size. The pins are secured to the piston bosses and are firmly fixed. Both the crankpin and the wristpin bearings are of a special alloy bearing metal.

The camshaft is at the right side of the motor and it is a special steel, drop forged, with the cams integral, of large proportions and is mounted on three long bearings. This shaft is heat treated and hardened and the cams are carefully ground to size. The timing gears are of special steel and have wide faces, being constructed to endure hard service. The valve action is regarded as particularly efficient. The valve ports are large and have a clearance that is sufficient to insure complete scavenging of the cylinders of the products of combustion, and to take in full charges of fuel gas. The valves are with cast iron heads electrically welded to stems of nickel steel. The valve stems are fitted in long bushings that may be renewed when worn and the springs are carefully proportioned to maintain their strength under



Top View of the Chassis of the Federal One-Ton Truck, Showing Chassis Complete Without the Mudguards, Running Boards, Body or Hood.

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Left, or Pump and Magneto, Side of the Power Plant of the Federal Chassis.

the high temperature of operation. They are held between heavy collars and are retained by keys. The tappets are of ample size and are ground to an accurate fit. They are operated in guides installed in bosses on the base flange of the cylinder units and are equipped with hardened adjusting screws and nuts to compensate for wear.

The right camshaft drives the oil pump and the motor governor and the left timing gear actuates the outside countershaft that carries the fan belt pulley, and operates the water pump and the magneto.

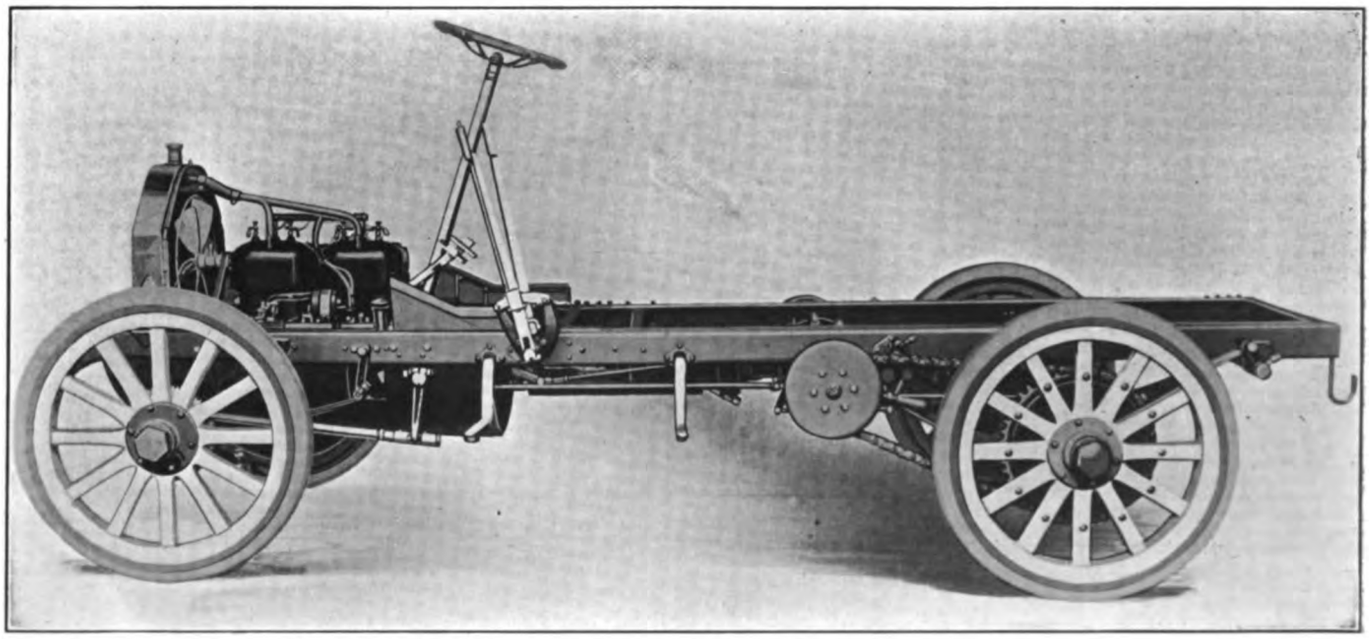
The motor is lubricated by a splash system from constant levels in the base of the engine case. The pump is located at the extreme rear of the case at the right side and is driven by bevel gears. The intake is at the lowest point of the oil reservoir attached to the bottom of the engine case and it is surrounded by a filter. The oil is drawn by the pump and carried through ducts to the compartment above the reservoir and there distributed to the channels or pits beneath the crankpins into which the ends of the connecting rods sweep. These channels are filled and the excess oil is drained to the reservoir to be filtered and used again. The splash lubricates the crankshaft and the camshaft and their bearings, the connecting rods, the wristpins, the wristpin bearings, the cylinder and piston walls, the valve tappets and the timing gears.

The engine is cooled by a circulation of water through the large water jackets. The water is passed through a large radiator of the vertical tube type by a pump of the centrifugal form at the left of the motor. The inlet pipe passes between the cylinder units and unites with a manifold that is connected with each pair of cylinders at the base of the exhaust valves. The water encircles the jacket and then passes out of the outlet manifold, there being a single lead from the centre of each cylinder casting that unites with a straight flow into the top of the radiator. All curves are easy and there is a rapid circulation of the water when the engine is in operation. The radiation is promoted by a large six-bladed fan mounted on a bracket attached to the forward cylinder unit. This has an eccentric adjustment so that the belt tension may be maintained constantly. The fan is driven by a flat belt from a pulley mounted on the left countershaft.

The radiator is mounted with each of its side supports carried between two helical springs so that there are no stresses upon it from chassis distortion or from road shock. These springs are carried on a guide rod fixed in a bracket installed on the chassis frame.

The ignition is by an Eisemann high-tension magneto with a fixed spark, this being regarded as being the most satisfactory for a service vehicle as it eliminates all possibility of mistake in adjustment, and as it is set at the factory at the point where the most satisfactory operation is secured it is not possible for the driver to abuse the engine. Under the heaviest kind of work the engine will gradually slacken its motion until it is necessary to change to a lower speed, but it will not be possible for a changed ignition point to overwork it. This form of installation simplifies the wiring and lessens the care and attention necessary. The four leads from the magneto distributor are carried to a duct mounted on top of the cylinders and thence to the spark plugs.

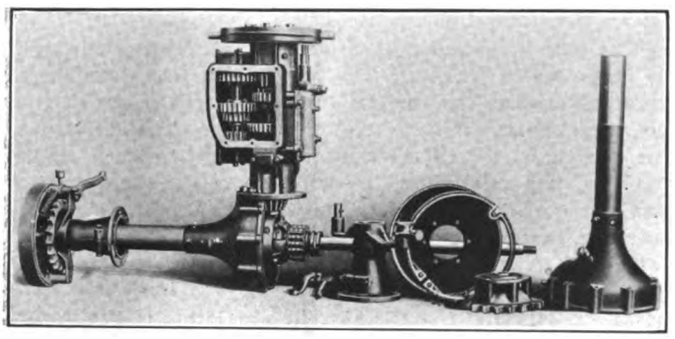
The carburetion is by an automatic carburetor of a float feed type, with independent adjustments for high and low speed, and is effective at all conditions of operation.



Side View of the Federal One-Ton Chassis Shown in the Preceding Illustration, Giving a Thorough Presentation of Details of Construction and Proportions.

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It is equipped with a dust cap and the gasoline level is permanently fixed so that it cannot be made inoperative through ignorance. It is provided with the combination



Federal Selective Gearset and Jackshaft Partly Disassembled to Show Construction Details.

hot air and starting device. There is a short riser to the large manifold, that has a wide sweep to each of the cylinder units. The carburetor is controlled by a governor that is installed at the rear of the motor at the right side, and this is set at the factory so that the motor cannot exceed 1000 revolutions a minute and it will not permit a speed greater than 15 miles an hour. The governor is positive in its action and is wholly independent of the regular control. The working parts of the governor are wholly enclosed and do not require more attention than oiling. There is no hand throttle, the gas control being by foot accelerator only.

The accessibility of the motor through simply raising the hood is one of the strongest recommendations made for it.

The clutch is a leather faced cone of 16 inches diameter that is carried on a shaft mounted in a heavy cross frame member. The cone facing covers six auxiliary springs that insure ease of engagement and prevent all jolts and jars under any condition of service. Two universal joints couple the driving shaft with the clutch and the transmission shafts, the forward end of the transmission case being carried by a cross frame member, and the rear end being bolted to the jackshaft housing. The transmission gearset is a sliding gear construction having three forward speeds and reverse. The gears are large and have faces 1.5 inches width and the shafts of nickel steel are carried on Hyatt high duty bearings throughout. The gears and shafts are heat treated to insure the greatest strength.

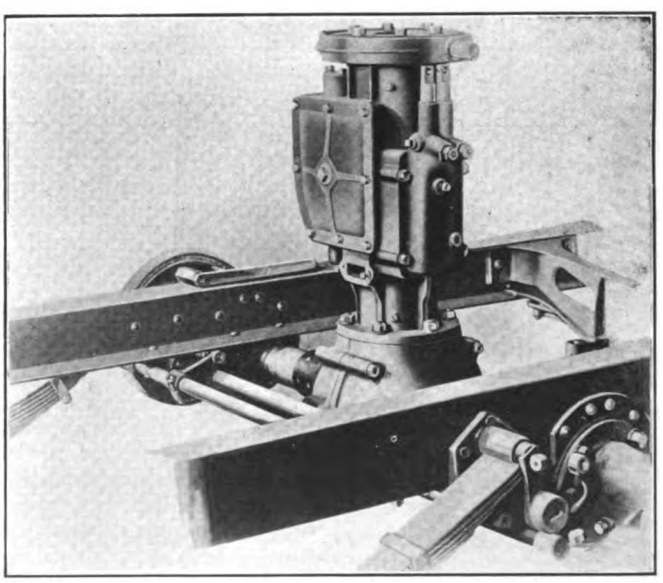
The gearset case is carried on a single support forward and the jackshaft housing is suspended in the frame with a flexible mounting, affording a three point suspension. Both the gearcase and the jackshaft are easily removable, either separate or as a unit, and they may be assembled on a bench during an overhaul and installed in the frame as an assembly. The frame brackets that carry the jackshaft are horseshoe shaped with the opening downward and are counterbored to receive the jackshaft housing brackets. By removing the retaining screws and sliding the housing brackets out a short distance from the frame the rear of the transmission-jackshaft assembly may be dropped clear of the frame. It is then removed from the chassis by drawing the assembly back far enough to disengage the universal mounting at the forward end. The design is such that the gearset casing may be removed from above or below without disturbing the jackshaft, chains, sprockets or radius rods. As will be noted from the illustration the jackshaft is mounted with heavy roller bearings and on the outer ends of the driving shafts are the sprockets and the service brake drums. The jackshaft housing is assembled with a series of large bolts retaining the differential case, there being large grease cups to afford lubrication. The gearset case may be examined by the removal of the inspection plate covering the shafts and gears.

The drive from the jackshaft to the rear wheels is by side chains and sprockets, the driving stresses being taken by the radius rods. These rods differ from conventional constructions in that they consist of four parts. The first is the hub brake centre that is mounted on the axle proper and turns upon the axle. To this is attached by a heavy hinge the radius rod or member, so that the rod may be swung from side to side. This rod is connected with a member that is bolted so as to encircle the tubular jackshaft housing by a threaded member. Any movement of the radius rod causes no strains, as either end will turn on the axle or jackshaft, and the hinge will compensate for side swing. There is a fitted bearing between the axle and the hub brake centre, which excludes dust or dirt and wear is minimized. As the radius rod and chain centres are the same the chain tension is uniform. The driving effort is always exerted from the rear axle to the jackshaft housing and the braking never unduly strains the springs or jackshaft.

Chassis frame is a cold pressed 20 point carbon steel channel section .21875 inch thickness with a width of 4.5 inches and a depth channel of from 1.75 to 3.5 inches, at the forward end—the point of greatest stress. The frame is strongly reinforced by the cross members and supports and the large gusset plates. A glance at the illustration of the chassis, top view, will make clear the construction.

The frame is suspended on semi-elliptic springs, the forward set being 40 inches length and 2.25 inches width, and the rear springs 44 inches length and 2.5 inches width. The front axle is a drop forged steel I section 2.75 inches deep and two inches width, with heavy yokes, wheel pivots and spindles. Rear axle is a steel drop forging two inches square. Both axles are equipped with Timken roller bearings and on these revolve wheels 36 inches diameter, built with spokes two inches square. The hub flanges are unusually large and the wheels are decidedly heavier and stronger than the equipment of vehicles of this size. The tires are 36 by 3.5 inches forward and 36 by four inches rear.

The chassis is with left side drive, and the control is exceedingly simplified. The machine is steered by an irreversible gear and an 18-inch hand wheel. There are no

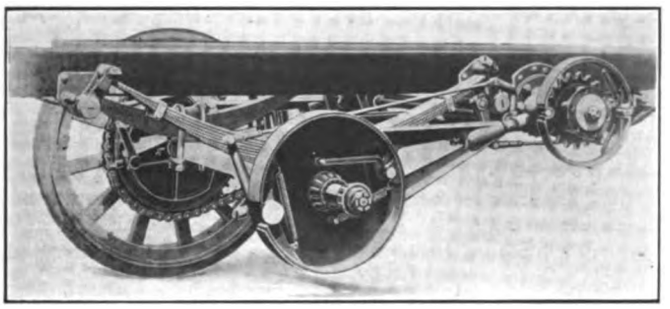


Federal Transmission Case and Jackshaft Turned in Chassis to Show Manner of Support and Ease of Removal.

hand levers on the steering column. The right pedal operates the service brake, which is of the internal expanding type, within drums 12 inches diameter and 1.5 inches face,

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mounted on the outer ends of the jackshaft. This brake is well housed and is not affected by water, dust, mud or lubricants. The left pedal actuates the clutch. The hand



Brake and Radius Rod Construction of the Federal Chassis, Detailing the Axle, Spring Suspension, and Frame Proportions.

levers afford the different speed ratios and operate the emergency brake, which is internal expanding within drums 16 inches diameter and two inches face. The brake drum and the rear sprocket are a unit and each is bolted close to the periphery through the spokes of the rear wheel, one bolt to each spoke. A foot accelerator is the only control of the fuel, which is supplied by gravity feed from a tank with 21 gallons capacity. The weight of the model C chassis is 3200 pounds and of the model D chassis 3300 pounds.

Throughout the chassis it may be noted that the design has been with the purpose of obtaining endurance, a quality that is emphasized by the proportions of the components, while there are numerous refinements that economize the time necessary to give the attention essential to effective upkeep. The design affords extreme accessibility, while the details have been carefully thought out. The assembly is attractive and substantial and the vehicles are maintained to be in every way extremely serviceable.

This idea may be conveyed by the first illustration of this article, which is of a chassis used by the United Railway of Detroit, Mich., and equipped for carrying a wrecking outfit and hose jumpers for use at fires. The body is distinctive in that the centre of gravity is very low, but the load is unusual in that the outfit at the rear of the body is carried in a flexible cradle. The cradle is suspended from a ceiling and in the event of an alarm it is dropped into the rear of the body and the machine is rushed off to the place of the alarm. At other times merely the wrecking tools are carried. The total weight of the cradle and its contents is 2100 pounds, and it is handled by a pneumatic hoist.

Where the Federal vehicles have been demonstrated, they have been found particularly reliable, this result being proven in the Chicago-Detroit-Chicago service wagon reliability contest last August, and in the Glidden tour last October, when a Federal went through both competitions and endured service that was considered in every way extreme.

PASSENGER SERVICE IN TEXAS.

The Texas & Pacific Railroad Company, in connection with the Weatherford, Mineral Wells & Northwestern Railway Company recently commenced the operation of a motor car service between Dallas and Mineral Wells, Tex., a distance of 86 miles. The cars will make two round trips a day, leaving Dallas at 9 in the morning and 4:10 in the afternoon, making the run to Mineral Wells in three hours. This plan is of interest, particularly to people leaving New Orleans on the limited at 1:30 in the afternoon and arriving in Dallas the next morning at 7:20, as it will provide immediate connections for them, by means of motor cars, so that they can reach Mineral Wells in time for lunch. It is stated that motor car service will later be established between a number of other points on the Texas & Pacific.

MACHINES FOR WATER DEPARTMENT.

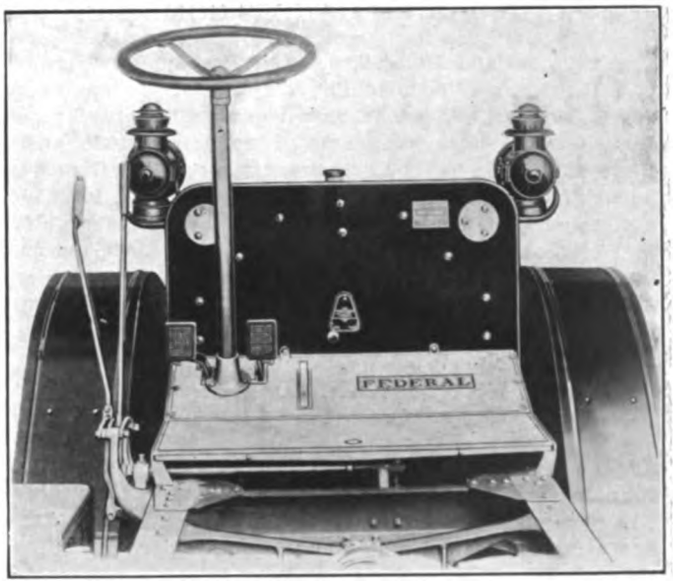
At a recent meeting of the water department commissioners of the city of Springfield, Mass., it was voted to add two more motor vehicles to the equipment of the department. One will be a runabout to take the place of Supt. Martin's car, which is being transformed into a delivery wagon, and the other will be a truck of three tons capacity, for use in transferring men and heavy piping to various points about the city.

MILK DELIVERY WITH PIERCE-ARROW.

A Pierce-Arrow five-ton truck, made by the Pierce-Arrow Motor Car Company, Buffalo, N. Y., was installed a few weeks ago by a Detroit creamery concern, and the use to which it has been put has long since proved its efficiency. The machine sees 21 hours' service every day with the exception of Sundays, when it is used but 12 hours. At 3 every morning the truck is driven from the garage and until 1 in the afternoon is busy delivering cream and milk in bottles and cans to stores and restaurants. While delivering, the crew is also engaged in gathering empties from the day before. Starting at 1, two trips and return to railway stations are made, each time with five tons of milk. At 2 the second driver goes on duty. He makes trips to various branches of the concern and to railway stations, the truck covering between 50 and 60 miles a day. The work done by the vehicle formerly required eight two-horse wagons and a single team.

AUTOCAR FOR ASHES COLLECTION.

The Massachusetts Institute of Technology, Boston, Mass., recently commenced the use of a truck, fitted with a special body, made by the Autocar Company, Ardmore, Penn., for collecting ashes, the car being fitted with an end-dumping device. In dumping, the forward end of the wagon is elevated by a chain belt operated by a hand crank-wheel. The attachment for loading consists of a line crane with block and fall. A large ash barrel is easily lifted into the wagon and emptied by use of the crane. The frame of the body is pressed steel, and the chassis has a capacity of



The Simplified Control of the Federal Machines, with Left Drive and But Two Pedals and Two Levers.

about 3000 pounds. The driver's seat is over the motor so as to give a maximum body platform with a minimum wheelbase. The maximum speed is 20 miles an hour.

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NEWS OF THE COMMERCIAL VEHICLE INDUSTRY.

National Association Laying Plans for Increased Show Circuit in 1912—Interesting Agricultural Contest for Canada—Many Concerns Enlarging Production Facilities.

The National Association of Automobile Manufacturers at a recent meeting in New York City decided upon a schedule for no less than 12 shows during the winter of 1913. Although the matter of truck shows is not taken into consideration in the framing of the circuit, wherever a separate truck show is given, as in New York, it may follow the pleasure car show. The special show chassis and other factory exhibits that the manufacturers supply for the pleasure car shows have few corresponding parallels so far as relates to commercial vehicles, stock machines usually being sufficient.

The proposed schedule of circuit show dates awards the opening exhibition to Cleveland, Jan. 6-11. It is considered that the plan will do away with a duplication of dates, give the manufacturers a continuous run of shows, minimize travelling and transportation rates, and give the makers every opportunity to co-operate with the dealers in arranging exhibitions and advertising. In other words, everyone connected with the business will know just what to expect and how to arrange accordingly. Following Cleveland, the shows will be: New York, Jan. 11-18; Philadelphia, Jan. 20-25; Detroit, Jan. 27-Feb. 1; Chicago, Feb. 1-8; Minneapolis, Feb. 10-15; Kansas City, Feb. 17-22; St. Louis, Feb. 24-March 1; Pittsburg, March 3-8; Boston, March 8-15; Buffalo, March 17-22; Indianapolis, March 24-29.

All the dates, with the exception of those awarded to Pittsburg, are definite, those in the case of the Pennsylvania city being left in abeyance until the association is able to ascertain whether rival trade organizations in that city are disposed to combine. A committee of dealers is to confer with the Motor & Accessory Manufacturers to secure from the latter organization the necessary sanctions that would permit the accessory makers to exhibit directly at all the shows on the list, instead of being limited to New York and Chicago.

OHIO TRUCK MAKERS COMBINE.

The Cleveland Motor Truck Company of Cleveland, O., and the Howard Automobile Company of Galion, in the same state, both of which have manufactured trucks on a limited scale, have amalgamated under the title of the Cleveland-Galion Truck Company. It is the intention of the officers of the new concern, which is capitalized for $500,000, to conduct a progressive campaign of expansion. Harry W. Woodward, who was president of the Cleveland company, is at the head of the new corporation. Offices will be retained in Cleveland, and the factories will be located at Galion.

NEW PACKARD MODEL.

The Packard Motor Car Company, Detroit, has placed a five-ton truck on the market, the addition of the new type rounding out the company's output of heavy duty vehicles. The new model is like the three-ton Packard except that it has a more powerful motor and is of heavier construction throughout. The machine has been introduced after 10,000 miles of testing, under conditions that would not be encountered in the ordinary use of a motor driven service car.

The motor is of 40 horsepower, S. A. E. rating, with a bore of five inches and a stroke of 5.5 inches. The wheelbase of the standard chassis is 14 feet long, but there are optional sizes giving frame lengths behind the driver's seat from 12 to 16 feet. There are standard and optional bodies adapted to meet a wide range of requirements, and to insure a long life to the vehicle, there is an automatic governor limiting the speed to 8.2 miles an hour.

MERGER IN LOS ANGELES.

The Durocar Manufacturing Company and the Amalgamated Motor Company, both of Los Angeles, Cal., were recently merged into a $1,000,000 concern. The manufacture of automobiles, including a medium priced truck, on a larger scale than ever before, will be commenced at Alhambra, Cal., within a short time. The firm name of the new concern will be the Durocar Manufacturing Company and the officers will be as follows: President, W. M. Varney; vice president, J. B. Teagarden; secretary, F. G. Stone; treasurer, J. E. Peters. Besides the officers the board of directors will include W. M. Northrup, F. W. Patten, O. F. Easley, J. D. McLeod, O. G. Myron, S. A. Bullis, E. U. Hickman, Douglas White, O. R. Rule and L. E. Parker.

GOODYEAR TRUCK TIRE PLANT.

The rapid advancement of the motor truck business in the past few months has led the Goodyear Tire & Rubber Company, Akron, O., to take steps to immediately increase its facilities for manufacturing truck tires. According to C. W. Martin, Jr., sales manager of the department, the output will be 1000 tires a day.

"Orders already have been placed," says Mr. Martin, "for additional equipment for the manufacture of all types of tires. The motor truck business is increasing wonderfully, and the tire output is an excellent barometer of the coming of the truck into commercial life and the passing of the horse."

LANGE MOTOR COMPANY FORMED.

One of the latest additions to the motor truck manufacturing industry is the H. Lange Wagon Company, Pittsburg, Penn. This firm, for many years one of the best known carriage making concerns in the country, has formed a subsidiary, to be known as the Lange Motor Company. The headquarters of the new organization are to be in Pittsburg, where a factory building, with about 40,000 square feet of floor space, has been erected and machinery installed. Trucks of one and two-ton capacities will be the only types manufactured at first.

TO MAKE CENTURY ELECTRIC.

The Century Electric Car Company has been formed in Detroit, a plant will be erected and the manufacture of cars, both of the pleasure and commercial types, will start as soon as possible. The company has been capitalized for $100,000, and the following officers have been elected: President, John Wynn, Jr.; vice president, Charles L. Weeks; secretary and treasurer, Edward Atkins; general manager, John B. Gillespie; additional directors, William A. Jackson, Philip Dreitmeyer and Howard Streiter.

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INTERNATIONAL MOTOR PLOWING CONTEST.

An agricultural motor competition will be held in connection with the Canadian industrial exhibition at Winnipeg, Manitoba, July 10-20, this event being open to the makers of the world. Two classifications are announced, one being in the nature of a fuel economy test and the other a gang plow contest.

In the first, five sub-divisions will be made, as follows: (a) Gasoline engines with piston displacement of 300 cubic feet a minute and under; (b) gasoline engines of 300-500 cubic feet a minute; (c) gasoline engines of over 500 cubic feet a minute; (d) kerosene engines under 500 cubic feet a minute, and (e) kerosene engines of over 500 cubic feet a minute. Provision also will be made for steam engines. The tests will include brake test, plowing and such other items as the judges shall determine. Fuel will be furnished by the exhibition association at a stipulated fee.

In the plowing competition, two sub-divisions will be made: (a) Engine plow with six bottoms and under, and (b) engine plow with more than six bottoms. The test will consist of one round of the plowing field, or longer if deemed necessary by the judges. The contestants may employ any kind of engine they wish. The depth of the plowing must be uniform and as directed by the judges. Each plow must cut full width. A recording dynamometer will be placed between the engine and the plow, and this will accurately record the pull.

In connection with the plowing test the quality of the plowing, which is to be judged by prominent agriculturists, shall have special reference to: Evenness of depth of furrow, uniformity of thickness of the furrow slice; straightness of furrow and finish at the ends. In connection with the evenness of the furrow, the exact depth prescribed by the judges must be maintained throughout the test. The number of furrows opened at the commencement must be carried through to the end of the test.

The directors in charge of this department are as follows: F. J. C. Coxe, chairman; Hon. George Lawrence, J. H. Parkhill, Hon. D. C. Cameron, G. F. Galt, Prof. W. J. Mitchell, Mayor Waugh, C. W. Sharp, and Aldermen Shore, Crowe and Gray. The associate directors are: J. H. J. Murphy, L. C. McIntyre, J. Clarke and W. F. Fuller. Arthur C. Frith is engineer and A. W. Bell manager.

NEW PLANT IN OKLAHOMA.

W. E. Nation is one of the latest to enter the automobile manufacturing field. He will establish a factory at Oklahoma City, Okla., and will place medium priced pleasure and commercial cars on the market. A building, which will have 12,000 square feet of floor space, is in process of construction. The initial cost of the plant will be $50,000.

SUMMER SHOW NEXT YEAR.

The summer of 1913 is very likely to see a commercial vehicle exhibition and demonstration under the auspices of the National Association of Automobile Manufacturers on a scale covering a wider range than was ever attempted before in the display of motor trucks. There is the possibility that the exhibition may take the place of winter shows as now held, this being a matter for which the opinion of the trade will be canvassed. The subject was discussed at considerable length at a meeting of the executive committee, preceding sessions of the N. A. A. M. in New York a short time ago, and many of the manufacturers looked upon the proposition with considerable enthusiasm. At present the matter is being considered by the show and commercial vehicle committees, their decision being awaited with interest.

TO BUILD NEW PLANT.

Fred L. Siebert, motor truck and carriage manufacturer, 530-532 Ontario street, Toledo, O., has been granted a permit by the building inspection department of his home city to build a $10,000 three-story brick building on Southard avenue. The building will be 118 feet long and 75 feet wide.

WITH BUFFALO ELECTRIC COMPANY.

Howard E. Wagner, until recently sales manager for Wyckoff, Church & Partridge, Inc., New York City, has been appointed in a similar capacity with the newly organized Buffalo Electric Vehicle Company, Buffalo, N. Y. He began his new duties June 15, and will make his headquarters in Buffalo.

Mr. Wagner's association with the industry dates from 1904, when he had charge of the selling of Pope Waverley electrics at Indianapolis, Ind. From 1906 to 1908 he managed the sales department of the Babcock electric carriage business conducted by Wyckoff, Church & Partridge, and from 1908 to 1910 he was branch manager of the Babcock Electric Carriage Company in New York City. In the latter year he became sales manager for Wyckoff, Church & Partridge, Inc.



Howard E. Wagner, Sales Manager, Buffalo Electric Vehicle Company.

The Buffalo Electric Vehicle Company is a consolidation of various electric concerns in Buffalo, N. Y., included among which is the maker of the Babcock electric vehicle. It is announced, as well, that the reorganized firm will enter the market with electrically propelled baggage trucks and other commercial vehicles. Extensive plans are under way for a far reaching campaign of manufacturing and publicity, with branch houses in Rochester, Chicago and Cleveland. Still other branches will be located in other sections of the country, under Mr. Wagner's guidance.

NEW TRUCK FROM SPRINGFIELD.

The Springfield Metal Body Company, Springfield, Mass., and the Brightwood Manufacturing Company recently consolidated under the name of the Nayasett Motor Company. The capital stock is $2,000,000. The new company will continue the manufacture of the Orson car, formerly made by the Brightwood company, and it is also planned to manufacture the S. P. A. trucks, which have been imported by the S. P. A. Import Company. The Smith brothers, formerly prominent with the Springfield company, are to be identified with the new concern.

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ANOTHER TRUCK FROM DETROIT.

Detroit's latest commercial vehicle is the Wolverine-Detroit, made by the Pratt, Carter, Sigsbee Company. An accompanying illustration presents one of these cars on the recent 703-mile run of the Wolverine Automobile Club from Detroit to Indianapolis and return. It will be noted that the roads were not always of the best, but the little 800-pound wagon made the trip, carrying an overload and travelling with the pleasure car tourists throughout the entire journey.

The Wolverine-Detroit is fitted with a single-cylinder, four-cycle, water-cooled motor, with bore of 4.5 inches and stroke of 5.5. Cooling is by the thermo-syphon system, lubrication by constant level splash, ignition by jump spark with coil and multiple dry battery, and carburetion by a float feed automatic type vaporizer, with a single gasoline adjustment. Drive is by friction discs. The tires are 32 by 3.5-inch pneumatics.

Throughout the trip mentioned, the car carried a load of 1105 pounds, at an average speed of 17 to 18 miles an hour. An average gasoline consumption of 20 miles to the gallon was recorded. Four men accompanied the vehicle, these being W. C. Pratt, H. C. Carter, N. J. Fleming and G. E. Buckley.



Wolverine-Detroit Light Delivery Car Acting as Baggage Wagon on Recent Cross Country Tour.

KREBS ORGANIZATION COMPLETED.

The final organization of the Krebs Commercial Car Company, Clyde, O., was effected recently and officers have been elected as follows: President, B. A. Becker; vice president, George Slessman; secretary, Homer Metzger; treasurer, Robert B. Jones; general manager, J. I. C. Krebs. All of these officers were formerly associated with the Elmore Manufacturing Company of Clyde, maker of pleasure cars. The new concern will produce, exclusively at first, a 1500-pound truck of the two-cylinder type.

NEW PLANT FOR KEARNS COMPANY.

In order to care for its increasing business, the Kearns Motor Car Company, Beavertown, Penn., has selected a site for a new building, and work will be commenced at once on the erection of a large modern concrete factory plant. Among recent orders received by the company was one for 100 trucks to be delivered in New York City and another for a shipment of solid tire surries to be sent to Uruguay, South America.

LOZIER TRUCKS NEXT WINTER.

Following an exhibition of a five-ton Lozier truck at practically all the big shows last winter, manufacturers throughout the country naturally expected the Lozier Motor Company, Detroit, to place the machine on the market this year, and at the time such was the intention of the company. It is now announced that deliveries will be delayed until next winter, President H. A. Lozier making the following statement:

"We have been actively engaged in the manufacture of motor trucks, but for the past three years we have been doing extensive experimenting in this line and have developed a five-ton truck which was exhibited at the larger shows last winter. At the time the truck was shown to the public it was our plan to manufacture 200 vehicles of this type, the first to be delivered about May 15. The remarkable increase in our touring car business, however, taxed our factory to the utmost and we found it would be utterly impossible to begin the manufacture of trucks on the date scheduled.

"Our dealers everywhere were anxious for definite delivery dates, and because of the demand made upon our factory by the increased touring car business we were compelled to announce to our dealers that it would be impossible to make delivery of trucks before next winter. This was naturally a great disappointment to the dealers as well as ourselves, because we had at that time just finished a nonstop run in which the Lozier five-ton truck had shown a wonderful performance. With an average overload of 30 per cent. the truck was run continuously for 488 hours. After this and many other severe tests the only change decided upon was to enlarge the diameter of the rear wheels."

PENN UNIT COMPANY ORGANIZED.

James K. Bowen of Allentown, Penn., has incorporated the Penn Unit Manufacturing Company to manufacture commercial motor vehicles. The company has a capitalization of $500,000. S. Bruce Somervell, formerly with the American Marion Sales Company, will take charge of the sales, and will have an office at 108 Fulton street, New York City. A demonstrating truck is already at the sales offices and has created considerable interest. It was driven from Allentown to Jersey City in 6:15:00.

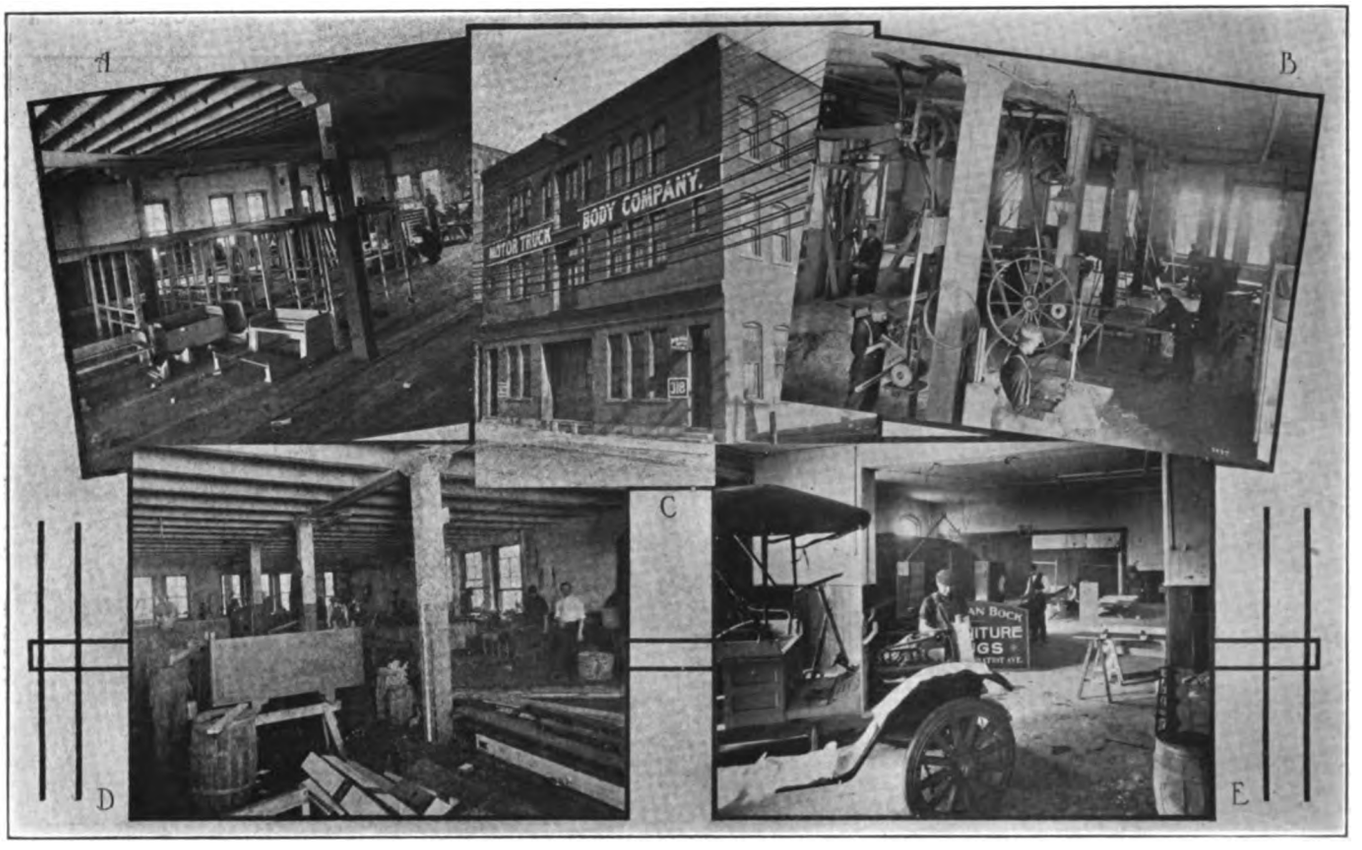
The Knox Automobile Company, Springfield, Mass., recently received the award of a contract to supply the city of Altoona, Penn., with a combination chemical wagon.

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BUILDING SPECIAL MOTOR TRUCK BODIES.

Manufacturing Equipment to Meet the Requirements of Different Delivery Service Has Been Developed as an Industry That Decidedly Benefits the Owner.

ONE need but observe the innumerable types of service wagon body equipment, to understand that there is, as a rule, at least a reason for the design and construction. Were the owner consulted it would be found, unless the vehicle had been built for another, that this reason justified the building of the particular body under consideration. That there are hundreds of styles is not too broad a statement. That there are special creations, produced to have a distinct advertising value, is apparent, but these are not to be considered, for they would be utterly valueless to another. They serve, however, as inspirations for others of a character that may be similarly utilized in business.



The Plant of the Motor Truck Body Company: A, Section of the Factory; C, the Front of the Building; D, Glimpse at the Assembling Department, Third Floor; B, Milling Division the Assembling of the Bodies; E, In the Painting and Finishing Shop.

The enormous demand for motor vehicles is inspired principally by a purpose to economize. That is, in theory, at least, and each purchaser seeks what will secure for him the capacity and other desired qualities. It might be possible to select a body that would be more or less useful and be particularly adapted for certain uses, but this could not be used with equally good results for a number of purposes. As the qualities that impel the purchase of a service wagon are its superior speed and capacity, it is essential that the body be chosen with reference for the particular work that it is to be used for.

First of all, if speed is to be made, it is necessary that the freight be properly loaded and packed, with a view to carrying the load as the chassis is designed to carry it. Next it is imperative that the body have space that will be sufficient, yet what will not permit overloading. Beyond this it is essential that the equipment be made of material and so constructed that it will yield the character of service expected from a motor vehicle installation.

Because of many reasons service wagon body construction has become a recognized industry. It has just as distinct a place with relation to highway vehicle building as has chassis manufacture, and the production of equipment that is absolutely correct is even more necessary because of the conditions that govern the use of chassis. Not only this, makers of truck and wagon chassis found that to meet the different requirements of prospective purchasers it would be necessary to maintain body building plants, involving the investment of large amounts of money and the maintenance of costly equipment and forces of high class and experienced employees, with no assurance that such factories would be productive, because of the uncertainty of demand. It was found that each order differed from another, requiring special work and attention, so that viewed from a practical viewpoint it was better to have the bodies built by men selected by the purchasers. In other words, making bodies that differ decidedly is not a work that can be done with success as a department of a chassis factory. It is feasible to produce one or two or several types of bodies as a manufacturing proposition, but to construct hundreds, each to its separate specification, is an industry in every way separate and apart from stock body making.

Obviously the special built body is more costly than one of a type of which hundreds are made and the different

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styles standardized. This must be realized by the purchaser, but it must be understood that unless the specially designed body is used there will be dissatisfaction and failure to obtain the fullest service of the vehicle.

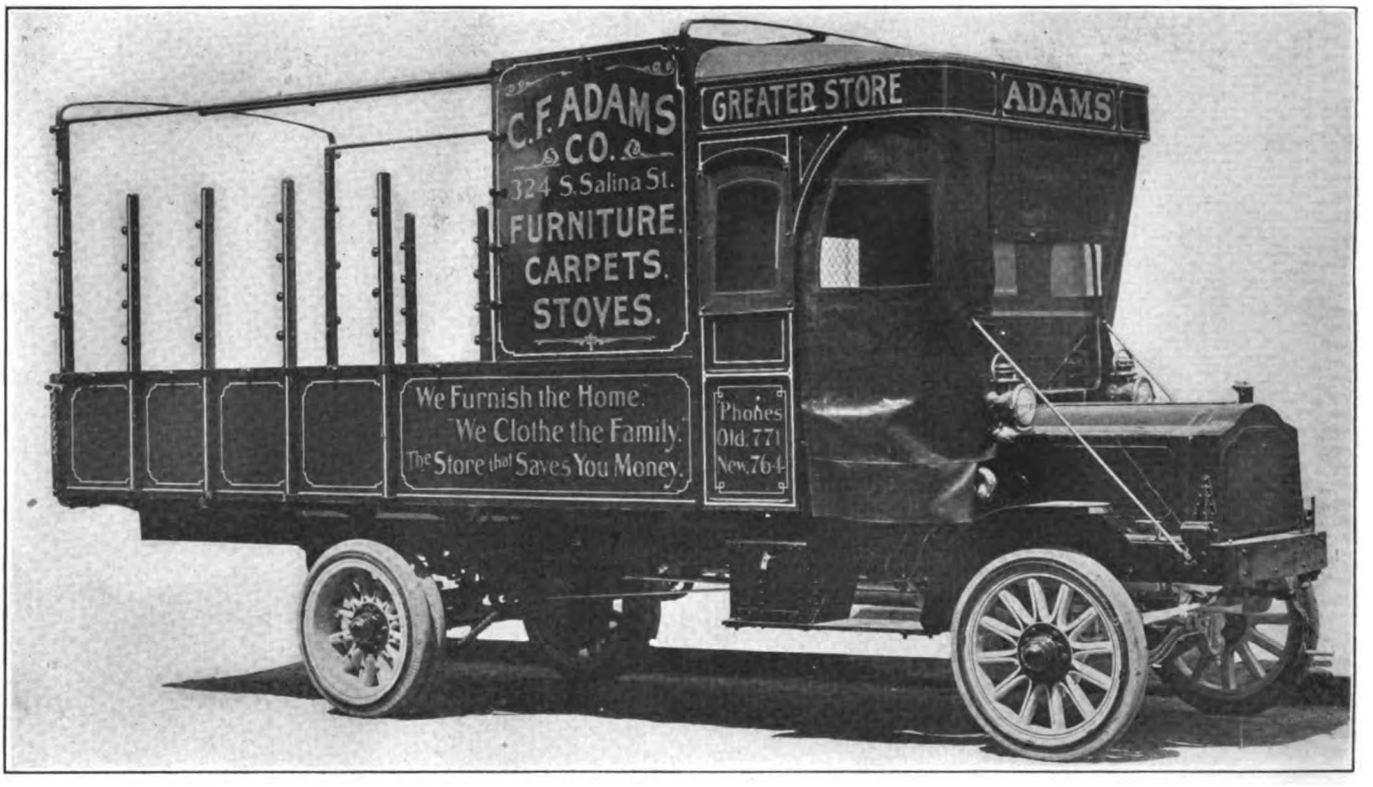
Viewed practically it will be clear that the chassis owner wants the fullest return for his investment. He cannot afford to take chances. He cannot be served to the best advantage by the chassis maker, and the difference in cost between the stock and the special body is such that there is false economy in accepting what is not wanted because it might be cheaper, and it is certainly not what can be utilized to the best advantage. Besides this, many of the buyers prefer to have the bodies constructed where they can supervise the work, which cannot well be done unless one is located close to the chassis factory. Again the chassis builders prefer to be relieved of a responsibility that is needless to assume.

It is evident that the obligation of the chassis manufacturer is limited to his guarantee and the only inducement for him to build bodies would be to insure the installation of equipment that would permit proper loading, but as this detail is quite as carefully considered by the special body builder there is nothing to be gained in this respect.

There are today about 150 different makes of service wagons in the market, and these range from one to a dozen chassis types. On any one of these chassis may be installed one of perhaps 25 different types of bodies, and so it will be seen that the manufacturer who produced three sizes of chassis might have a demand for any one of several hundred bodies, and be prepared to construct any of these to order, or to make modifications to meet requirements. Prepared for stock production, he was not willing to specialize. Then came the policy of selling the chassis, the purchaser to provide the body he wanted, made to his specifications by a local body maker. This is the selling plan that is followed today. There are two influences—the disposition of the manufacturers of the chassis, and the demand of the buyers—that have established the body building industry. There is every reason to believe that these will be more and more strongly manifested as the industry is developed.

The construction of service wagon bodies has been recognized as offering to energetic and progressive men unusual opportunities, and a considerable number of enterprises of this character have been established. These concerns have entered the field with, as a rule, realization that success is proportionate to the work that can be produced; that in this, as in all industries, economy of production and excellence of workmanship and design are imperative; that it is necessary to study each requirement and create and develop what will best serve each demand, and that there is possible a promotion of motor vehicle use by intelligent co-operation with the buyers and users of chassis.

It is natural enough that especial attention should be devoted to body building in and about Detroit, which is the largest mechanical vehicle producing city in the world. The location is admirable for co-operation with different truck chassis manufacturers of that city and vicinity, and to have available every detail of necessary information and the assistance of the designers and engineers. One of the largest and best equipped plants in the country devoted exclusively to designing and building bodies for motor trucks is the Motor Truck Body Company of that city.



Body for Furniture Delivery Built to the Order of the C. F. Adams Company, Syracuse, N. Y.

This concern has been established since the first of the year and has already produced bodies that are used in probably three score different industries. The services of the company's experts are demanded daily by business men who have found their knowledge and advice of decided assistance in dealing with all manner of haulage problems. The company is receiving specifications from customers in New York, Boston, St. Louis, Atlanta, Chicago, New Orleans, Denver and San Francisco, as well as many other cities, which demonstrates how widely spread is the business, and how dependable the company is rated by business men.

It is claimed that tests have been made with standard forms of bodies and the new types, and that in every instance for investigation the special construction has more nearly served the needs and requirements of the owners; that in many instances the results with these types were

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greater efficiency and with savings in operating costs that were appreciable. Not only this, it is held that there was a considerable saving in cost when compared with the special work of a chassis builder.

It is natural enough that an establishment of this character received the approval and the recommendation for business of every truck builder in Detroit and vicinity, this because it made it possible for their local customers to receive personal attention, and from the fact that their representatives in other sections of the country could assure their customers of satisfactory equipment, adapted for any work.

The executives of the Motor Truck Body Company are practical men, who have had large experience, and have, from their careful study of the conditions and the needs for vehicle bodies, qualifications that insure to their patrons the best that sound engineering, skilled workmanship and high class material can produce. The president of the concern, Frederick Proctor, is the engineer and designer, and he was for a considerable length of time in charge of the designing of truck bodies for the Packard Motor Car Company. Elmer T. Hangstefer, secretary, treasurer and general manager, had charge of the truck body accounting department of the Packard plant, and the factory and production manager, Harry Carrier, for several years built the Packard truck bodies.

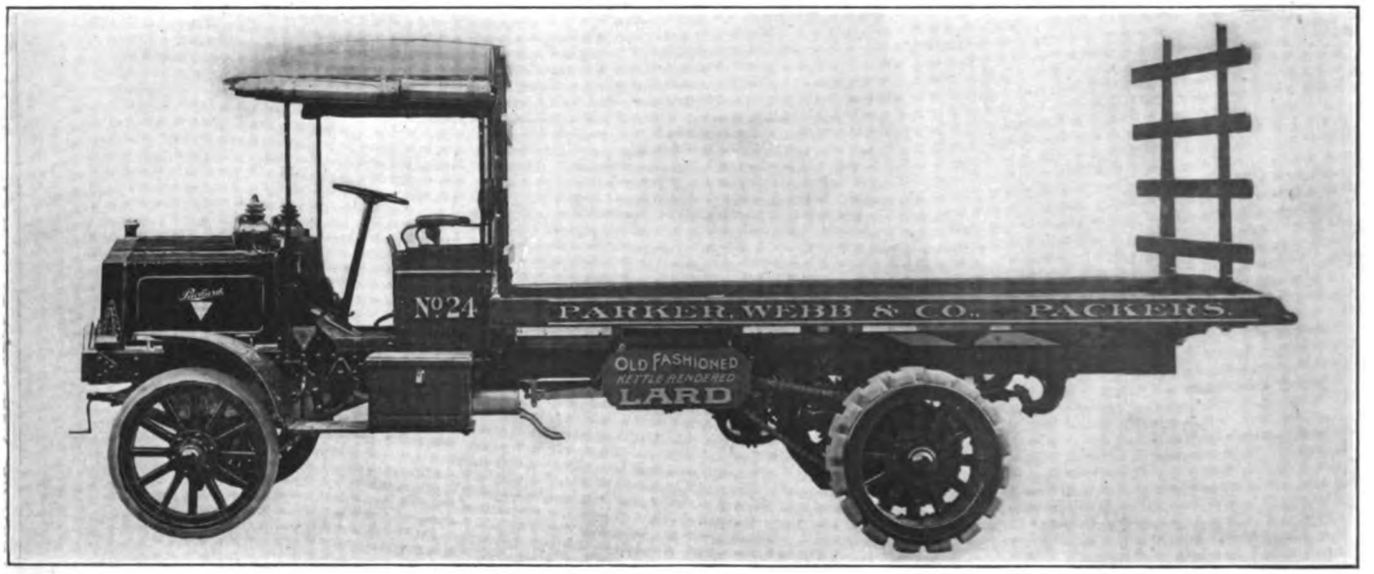
In designing bodies Mr. Proctor has originality and as his experience has been with the wagon and carriage trade as well, he has produced types that are practical and sightly and are especially adapted for the service required. Mr. Hangstefer has established a cost system that insures to the purchaser the exact value for the job—not an approximation or an average. He had charge of cost estimating at the Packard factory and figures to exactness. The employees have all had training in power wagon factories and are regarded as expert workmen.

In the engineering department of the factory are filed blue prints and specifications of nearly all the standard motor truck chassis in the market, and these files are kept to date, ready for instant reference. As building motor truck bodies makes imperative complete knowledge of chassis design and construction, by the study of this information new types are thought out and created.

When an order is placed with the company the designers carefully consider the customer's requirements, discuss his particular needs, the conditions of delivery and haulage, operating costs, etc. With this information, and knowledge of the chassis decided on, the body is designed, it being adapted to the chassis and to the business needs. Horse vehicles are not in any way considered.

An instance in point is the body for the Cleveland branch of the Packard Motor Car Company for the Cleveland & Sandusky Brewing Company of Cleveland, O. The equipment is on a three-ton Packard chassis. As may be noted in the illustration it can be loaded at either side by the removal of a centre panel, or from the rear. The body is adapted to brewery haulage or to general delivery purposes. It may be used in narrow streets or drives, is especially convenient for loading or unloading, and does not obstruct the thoroughfare.

Another illustration is the body built for the three-ton Packard chassis owned by the C. F. Adams Company, Syracuse, N. Y. This is intended for the delivery of furniture and for use in all weather conditions. The cab is ample for the crew and it can be entirely enclosed, as is shown. The large express type body has high sides and is fitted with large side panels and a standing awning or top frame, supported from the side panels forward and the two rear stanchions. Four stakes are fitted at either side. The panels, stanchions and stakes are provided with series of pins by which a large load, piled high, can be securely roped. The load can then be protected by the tarpaulin cover, which is kept from contact with it by the frame. When not in use the side stakes may be removed. The provision for securing the load means a considerable saving of time in loading and unloading.



Platform Body Constructed for Special Work of Parker, Webb & Co., Detroit, Mich.

An adaptation of a platform body for the general haulage of a packing house is illustrated by the equipment for the chassis of Parker, Webb & Co., Detroit, this having a rear rack to retain the load when it is piled high. This body is utilized with a tarpaulin or similar cover.

The company has turned its attention toward the production of bodies adapted for municipal service requirements, and its designing force is developing a new form of body for a police patrol, to be mounted on a light chassis with large motor, that will be instantly convertible into an emergency ambulance, and still carry its crew of patrolmen without discomfort to them. Designs are now making for a combination fire department squad wagon that will have some entirely new features in fire apparatus equipment. This body will be mounted on a high powered pleasure car chassis. Another design now developing is that of a pay-as-you-enter sight-seeing 'bus, with capacity for about 30 passengers, which will have a speed of 15 miles an hour.

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The seating arrangement will follow the idea of the Pullman cars and the windows will open and close in a manner similar to those of the pay-as-you-enter trolley cars. The driver will be seated outside of the car body. The body is to be mounted on a three-ton truck chassis and it is expected to be especially adapted for sight-seeing and passenger service in parks, pleasure resorts and to suburban points.

Of course in the production of work of this character it is necessary that the plant have ample facilities, and the factory of the Motor Truck Body Company is complete, so that the body may be produced in every detail, beginning with the rough lumber and ending with the handsomely finished and decorated equipment, including tops, curtains, and the like. All the mill work, assembling, blacksmithing, painting, lettering and decorating is done in the shops, which occupy a large building in the centre of the automobile building industries of the city. The machine tools are new and of the latest types, among them being cut-off saws, band saws, rip saws, mortisers, jointers, planers, sanders, and similar labor saving machines.

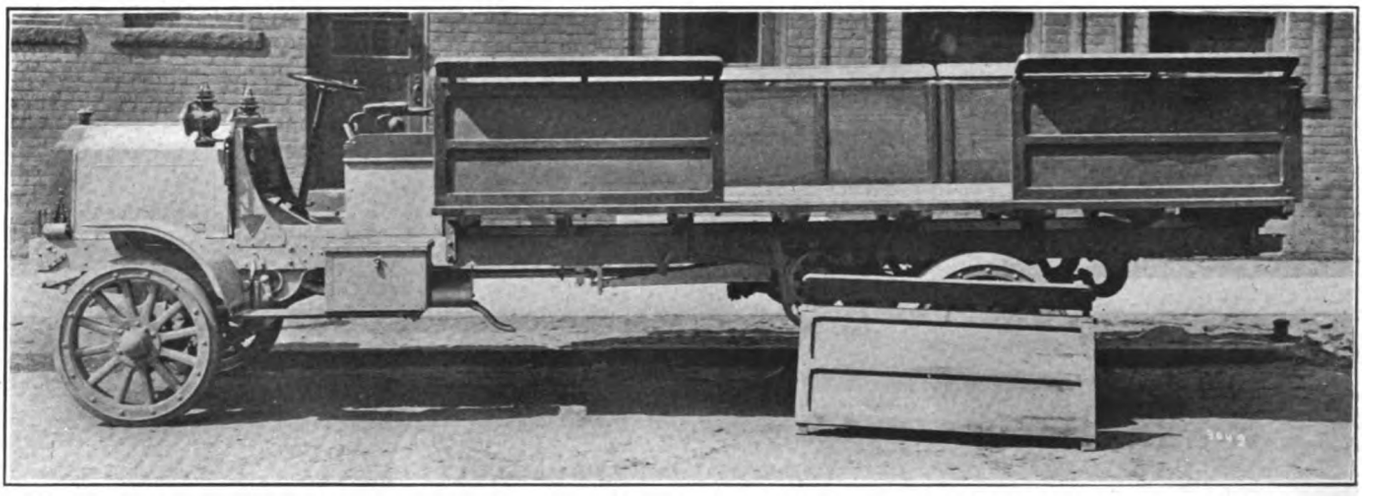
One of the factors in the general efficiency of the factory and its economy of production is the blacksmithing facilities. It is usual to have a single shop where this work is done, but instead of this in the assembling departments on the second and third floors are several forges, and that nearest to the job is utilized, so that there is a saving of time of the workmen, a considerable item when the jobs are numerous. This is one of the economies that is a decided saving for the customer.

The body panels are made from kiln dried poplar, the stakes are of hickory, the stringers of kiln dried oak and the floor boards of similarly cured ash. The materials are of the highest quality, and carefully dried and seasoned so that when the body has been in use it will not check. The equipment is constructed to endure and tops are of A1 oiled duck. The work is performed by men who are experts in their lines. All joints are leaded and every screwhead is countersunk. The finishing is made with equal care, and the work is given a uniform attention from the draughting room to the final decorating.

The specialized skill of this concern is available to the chassis maker and his customer, and there are possibilities for the utilization of differing chassis because of the attention devoted to development of bodies that will in every way meet the requirements of the business men. It is apparent that the assistance that can be given the purchaser by the body expert is a considerable factor in promoting the use of motor trucks, and the result is realized by the chassis builders, who can have their vehicles serve when they would not seem satisfactory unless bodies were provided so as to render them adaptable for purposes desired.

As a matter of fact the body building expert can be of much service to the truck chassis manufacturer because he can, by studying the haulage problems, develop the use of service wagons to their fullest value, and accomplish a creative work that could not be undertaken by the selling organizations save at great expense and decided loss of time. Not only this, the advice of the body designers will be of especial value in that it will be accepted by the chassis manufacturers as founded on sound principles and business requirements, and it will have weight in the future perfection of all forms of highway transports.

The organizations that are now established and working in this new industry will be the leaders and will have no small part in the real development of haulage economy, in which there are almost unlimited possibilities.



Brewery Body Designed for the Cleveland & Sandusky Brewing Company of Cleveland, O.

KELLY COMPANY ENTERTAINS.

By invitation of the Kelly Motor Truck Company of Springfield, O., nearly 30 fire chiefs and members of municipal bodies from various sections of Ohio, western Pennsylvania and West Virginia were its guests recently. Trial runs and demonstrations of a new combination hose and chemical were witnessed, numerous parties being taken on runs from one end of the city to the other. The visitors were entertained at luncheon and dinner at one of the leading hotels. Those present were: Chief Lughler, Youngstown, O., president of the International Association of Fire Engineers; Chief Frank J. Connery, New Castle, Penn.; N. R. Hamilton, Youngstown, O.; C. A. Chambers and Chief Fred L. Martin, Chester, W. Va.; W. B. Martin, Steubenville, O.; Chief J. P. Hay, East Palestine, O.; E. W. Connelly, member of council at New Castle, Penn.; Chief Phillips, Wellsville, O.; Chief Roew, Wheeling, W. Va.; W. A. Lyon, C. J. Hubbard, H. Beck, S. J. French and Peter Huntz of Ravenna, O.; T. W. Dixon, president of councils, New Castle; Fred Peace, representing the Gamewell alarm systems; Charles Ansley, Springfield, and A. L. Forschler, mechanician of the Kelly Motor Truck Company.

REO REPLACES HORSES.

The Reo Motor Car Company, Lansing, Mich., recently delivered one of its motor trucks to the Sample Hardware Company at New Castle, Penn. It is the plan of the purchaser to make all its deliveries in the future by motor, and to entirely do away with horse drawn vehicles.

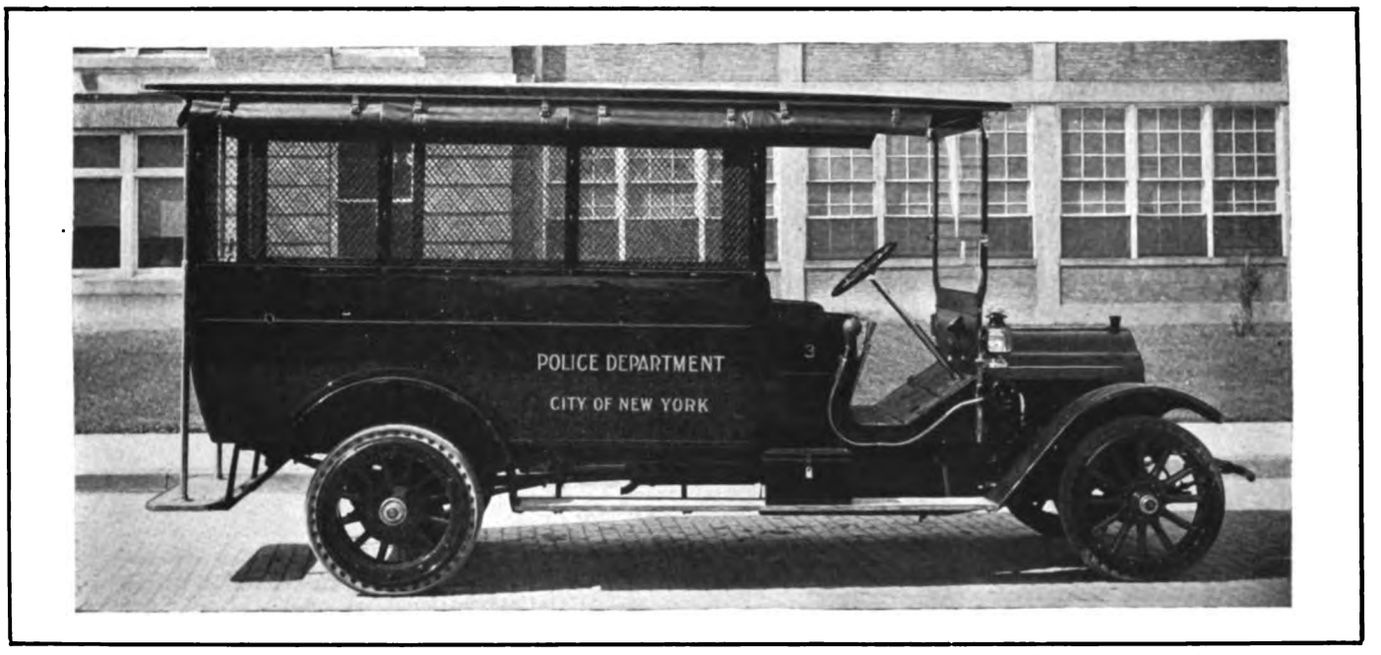
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MOTZ TIRES ON GARFORD PATROLS.

The first motor drive patrol wagons in New York City were placed in service recently, when three Garford machines, made by the Garford Company, Elyria, O., were assigned to duty below 14th street, replacing nine horse drawn vehicles. These will be given a reasonable trial, and if found satisfactory it is planned to increase the equipment, practically eliminating horses in this service in the metropolitan district.

The chassis is the standard Garford public service type, with 40 horsepower motor, four speed transmission, press steel frame and wheelbase of 145 inches. A significant feature of the equipment is the tires, which are Motz cushion, made by the Motz Tire & Rubber Company, Akron, O.

In specifying Motz tires, the police department appears to have had in mind doing away with tire trouble and at the same time operating the cars under conditions producing easy riding qualities. The maker claims that the double notched treads prevent skidding and distribute the weight to the sides. In addition, it is held that the undercut sides allow free action of the bridges, producing resiliency. Each set is guaranteed for 10,000 miles—practically two years service.



Garford Patrol Recently Installed by New York Police Department, Equipped with Motz Cushion Tires.

BAKER SPEAKS IN MONTREAL.

Day Baker, New England manager for the General Vehicle Company, recently delivered an address before the new Montreal Electrical Society in Montreal, Can. He was the first speaker and took for his topic, "The Electrical Vehicle; Its Success and Its Future." He illustrated his paper with lantern slides and moving pictures. One of the latter showed the electrical vehicle parade which was held in Boston a short time ago.

MAINE TRANSPORTATION SERVICE.

The Maine Transportation Company, authorized to carry passengers and freight by means of motor carriages between the cities of Augusta and Rockland, and elsewhere in the United States and Canada, has been formed at Augusta, Me., the certificate of organization being filed in the department of state the latter part of May. The officers are: President and treasurer, E. M. Leavitt, Winthrop; clerk, Ernest L. McLean.

KISSELKAR MAKES RECORD.

A KisselKar three-ton truck, made by the Kissel Motor Car Company, Hartford, Wis., recently made a wonderful record in climbing Mount Hamilton, California, said to be the steepest regularly travelled grade in the United States. The route was from San Jose, at sea level, to the Lick observatory, at an altitude of 4209 feet. The distance covered was 27 miles, in 6:25:00, and that with the machine loaded 50 per cent. beyond its rated carrying capacity. The first 21 miles were made in three hours. The last seven miles, an ascent of 2200 feet, with 365 sharp turns, some of them extremely dangerous, required 3:25:00.

G. M. C. FOR ELECTRIC FARM.

The electric farm is the latest thing. This unique institution is located in the outskirts of Boston, Mass., and is operated by the Boston Edison Company. With the installation, recently, of a two-ton G. M. C. electric truck, made by the General Motors Truck Company, Detroit, its title to the name "Electric Farm" was made complete. Electricity does everything in this establishment. It cuts the fodder, milks the cows, washes the dishes, pumps the water, churns the butter and finally takes the product of the farm to the city in an electric truck.

BALL JOINTS FROM FLORIDA.

A large plant for the manufacture of patent ball joints for spark and throttle controls for automobiles will be established in Jacksonville, Fla., soon, the enterprise to be operated by C. W. Birchwood of Chicago, Ill. The factory, which will be 30 by 100 feet, is in course of construction. The power used will be obtained from gasoline motors, and automatic machinery is being installed at an approximate cost of $25,000. The concern has been manufacturing the joints for three years, the change being made to Florida because of climatic conditions. The product has to be highly tempered in oil, and in Chicago during cold weather the oil is apt to congeal, necessitating extra heating facilities in the plant. This condition, it is thought, will be eliminated in Florida.

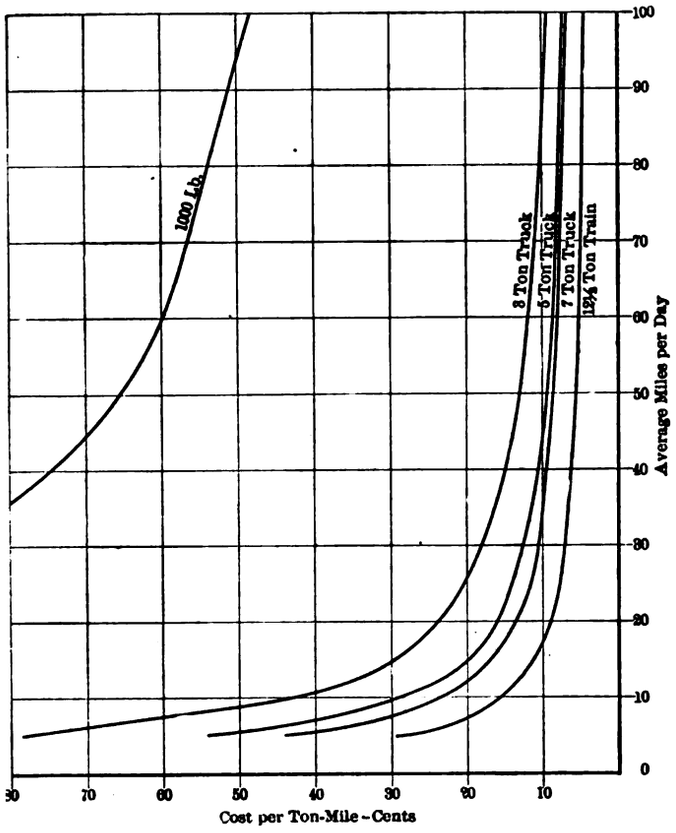
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COST OF UTILIZING GASOLINE TRUCKS.*

By Louis Ruprecht.

THE graphic charts of actual costs of operation, and cost a ton-mile of work of motor trucks which I present herewith, are merely a tabulation, for convenient reference and study, of truck economy under varying conditions of loads and mileage. They are intended more as a comparative study than a discussion of specific costs, but it is nevertheless in order to review the detailed figures used in arriving at the total costs for plotting curves.

Depreciation is figured at from 10 to 15 per cent., varying according to mileage and the size of the units, the tire value being deducted from the cost of the complete vehicles. One of the highest priced types of truck is assumed in each case. The depreciation figures are based on experience with hundreds of this type of truck in use over a long



period of years, in many instances longer than 10 years. It is only fair to say that the depreciation of the newer, more flexible models will be less than that of the older ones.

Drivers' wages on 1000-pound delivery wagons are taken at $2.75 a day, and on trucks $3 to $4 a day according to size and length of day's work. Helper on trailer is $1 a day. These figures in the case of a very large day's work might conservatively be figured a trifle higher. Garage charges include only washing and storing of the vehicle: $240 to $300 a year according to size. Tire cost is based on prices to user and 8000 miles life as guaranteed by makers. The sizes figured are all in accordance with the makers' specifications based on weights of vehicles and loads, and therefore this large item of expense is figured conservatively. Gasoline cost is taken at 11 cents a gallon. The price at this writing is a little higher, but only three to 6.5 miles a gallon is assumed as the performance according to size of vehicle. Oil cost is taken at 30 cents a gallon; 50 to 125 miles a gallon according to size of vehicle.. Insurance, $100 to $250 a year according to size. Repairs and replacements have been figured up to three cents a mile in the case of heavy trucks. This is based on extensive records.

Operating days a year have been taken uniformly at 300. This figure is a trifle high, particularly in cases where large daily mileages are made, although it leaves 65 working days and holidays for the upkeep of the equipment.

Attention is now called to the first set of curves showing the actual costs of hauling, expressed in dollars a year, for different sizes of units for varying average daily mileage.

The ordinates indicate the average daily mileage from 10 to 100 and the abscissa the total cost a 300-day year, all charges included. It so happens that on the basis of my figures the plotted costs are straight lines in every case. This indicates that the total costs increase in constant ratio with the daily mileage. These straight lines if continued to zero miles should indicate theoretically therefore the fixed and other charges against the equipments when idle, and in fact this is approximately the case; for it will be found that costs thus indicated at zero miles are practically the sum total of depreciation, interest, part-time wages, dead storage, insurance, tire depreciation, etc., actually chargeable against a vehicle temporarily out of commission.

This situation has suggested to me a convenient thumb rule for figuring costs of operation, making unnecessary the use of this chart, as follows:

Cost a Day = "Fixed Charges" + (Miles a Day × Daily Increment in Cost.)

Size	Fixed Charges	Increment a Mile
1000-lb.	$5.07	$0.0686
3-ton	5.33	0.0860
5-ton	5.60	0.1253
6-ton	6.00	0.1540
7-ton	6.15	0.1718
12.5-ton train	7.40	0.2070

For example, the cost of operating a six-ton truck, all charges included, 45 miles a day, will be $6 + (.1540 × 45) = $12.93. Costs a ton-mile can of course be derived similarly without reference to the second set of curves which I present herewith; for these costs have been derived from the first set of curves.

In computing costs a ton-mile it is assumed that vehicles are fully loaded half total daily distance travelled, or, what is equivalent, that vehicles carry half their rated capacity load the full distance. If they carry more than this the costs a ton-mile would be correspondingly reduced below the figures of the curves. For instance, with full load the entire distance, the cost a unit of work would be reduced almost one-half. I say "almost" because depreciation, repairs and renewals and fuel per loaded mile are somewhat greater than per dead mile.

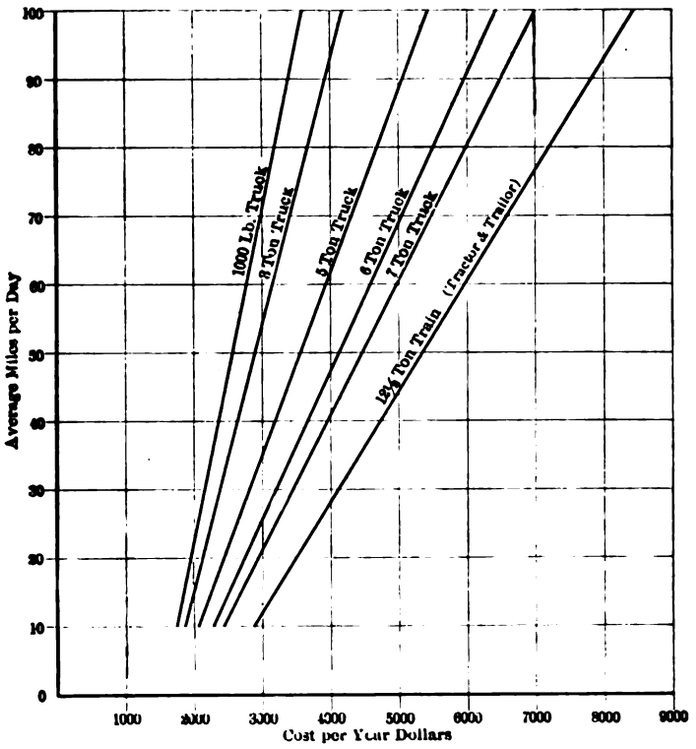
A study of these curves reveals the large reduction in cost a unit of work by increasing daily performance as follows:

Increasing —Daily Mileage— From	To	——Reduction in Cost, Per Cent.—— 3-ton	5-ton	7-ton	12.5-ton
10	20	44	44	44	44
20	30	25	20	21	20
30	40	17	17	12	11
40	50	14	14	10	10
50	60	10	8	8	9
60	70	7	6	4	5
70	100	12	8	11	10
40	100	38	32	30	30

In other words, increasing the daily work from 10 miles

*Paper read before summer meeting of Society of Automobile Engineers in Detroit.

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daily average to 20 reduces the cost a ton-mile, or unit of work, 44 per cent. in all cases. Then increasing the daily work to 30 miles another reduction of 20 to 25 per cent. in cost a unit of work is effected. And increasing from 30 to 40 miles a day 11 to 17 per cent. reduction in cost is effected. Substantial gains in economy are made by further increase in daily mileage; increasing from 40 to 100 miles a day, for instance, effects a reduction of 30 to 38 per cent. in cost a unit of work.

These curves are impressive as indicating the economies to be effected by proper routing of vehicles for maximum daily work. The costs, as above mentioned (being based on loads one way only), can be very materially reduced if merchandise or material can also be carried over some of the "dead mileage" assumed in these computations.

The approximate parallelism of the curves indicates that whether light trucks, heavy trucks, or trucks and trailers are employed, economy increases with increased daily mileage at about the same rate with all these sizes of units.

These curves are also of interest and assistance in studying the question of sizes of units to be used for any particular class of work. They show, for instance, that a 12.5-ton train (seven-ton truck with 5.5-ton trailer), operating 70 miles a day and loaded only one way, will carry one ton of load one mile for five cents, whereas the same one ton carried one mile in smaller units operating 70 miles a day would cost 10.75 cents on three-ton, eight cents on five-ton and 7.5 cents on seven-ton units; thus indicating the tremendous advantage of using large capacity units and frequently trailers wherever large tonnage is available.

They show also, for instance, that the same economy, viz., 10 cents a ton-mile, is obtained by operating a three-ton truck 84 miles, a five-ton truck 44 miles, a seven-ton truck 35 miles, or a 12.5-ton train only 18 miles a day.

The proper routing of heavy transfer units and of lighter distributing units, the adoption of correct sizes of units for such service, or for pure straight haul service, the proper load handling facilities, are all problems which frequently require careful study, always with an eye to the practical conditions of each particular service, to obtain maximum efficiency and economy. Many an installation in the past might have been saved from economic and mechanical failure with more careful study of these conditions, and to bring out the glaring differences in costs a unit of work and to show the possibilities of efficiency study has been the purpose of this paper.

BUYS POPE-HARTFORD PATROL.

A Pope-Hartford patrol wagon, made by the Pope Manufacturing Company, Hartford, Conn., is to be delivered in Richmond, Va., soon, the purchase being made by the city through the Chesterfield Motor Company. It is planned to eliminate the use of three horse drawn wagons.

SELLS MACK TRUCKS.

The Whitcomb-Carter Company of Beverly, Mass., has been doing an exceptional business recently in the sale of Mack trucks, made by the International Motor Company, New York City, at its plant in Allentown, Penn., motor driven commercial vehicles having been placed with the Peoples Express Company of Ipswich, McKenzie Express Company of Gloucester, Dunn's Express, Manchester, N. H., and one with the H. P. Woodbury Company of Beverly.

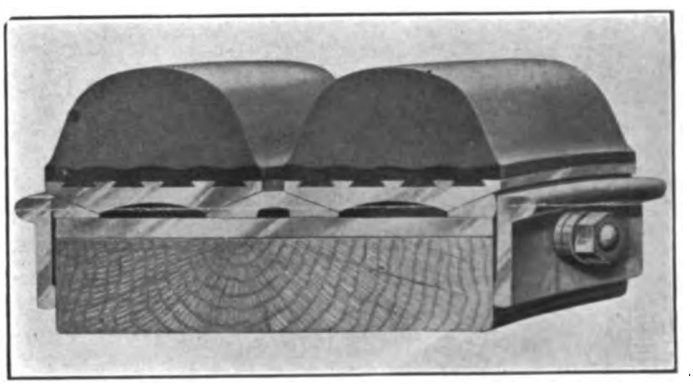
PREDICTS GOOD SEASON.

Manager Charles A. Malley of the Boston branch of the Universal Motor Truck Company recently had a successful trip to Providence, R. I., where he sold Universal three-ton trucks to the Atlantic Mills at Olneyville and the Revere Rubber Company of Providence. Mr. Malley predicts an unusually eventful season for the motor truck business in New England.

UNITING RUBBER AND STEEL.

The method of uniting perfectly the soft rubber tread with the steel is one of the features of the Goodyear solid demountable tires depicted in the accompanying illustration. The method is the result of six years of experimentation and service by the Goodyear Tire & Rubber Company, Akron, O., and as will be noted in the picture the attachment of the soft rubber tread is through an intermediate stratum of hard rubber which combines with the metal in a manner similar to ferro-concrete.

P. W. Litchfield, factory manager of the Goodyear company's plant at Akron, visited Europe in 1906 and made a study of the solid tire problem for industrial transports. He conceived the idea of the hard rubber base and upon his return to this country a series of experiments were conducted which resulted in the present product. The tire was not placed on the market until exacting tests had been conducted, all of which the shoe withstood successfully.



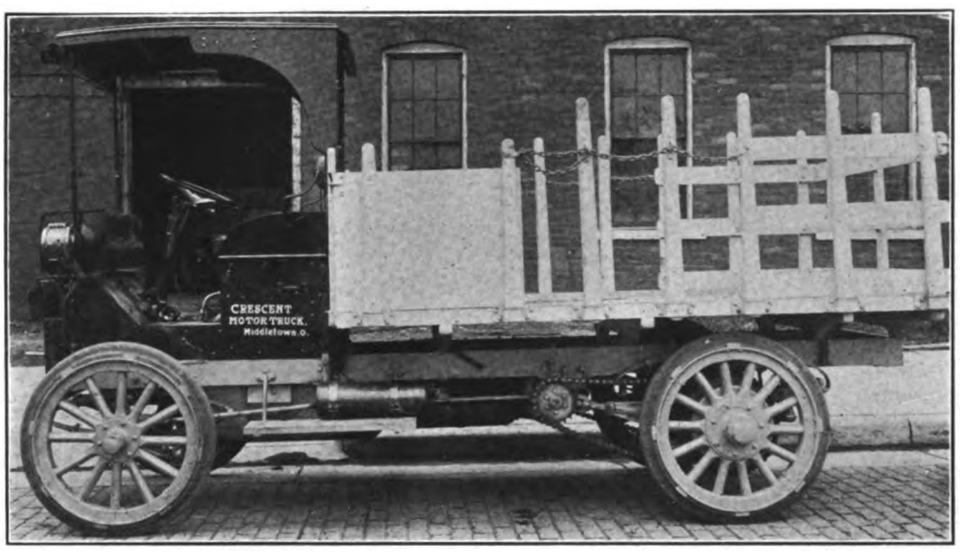
Outlining Goodyear Method of Uniting Rubber Tread with Steel Through Means of Hard Rubber.

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ACCESSIBILITY A SILENT CRESCENT FEATURE.

ONE of many interesting features of the Silent Crescent, made in one, two and three tons capacity by the Crescent Motor Truck Company, Middletown, O., is the location of the motor under the seat with the desirable easy accessibility of the under-the-hood type. This is obtained by a novel arrangement of the front seat which is divided and so constructed that both portions may be pulled out and swung to the rear, the operation involving but a few seconds, and it is pointed out by the maker that it may be performed as quickly as unlocking and lifting a hood. It is also claimed of the design that considerably more of the power plant is exposed for inspection, and that it permits of the utilization of a shorter wheelbase by 24 inches, enabling easy turning of the machine in narrow streets.

In the matter of the distribution of the load the maker of the Silent Crescent states that 65 per cent. is carried on the rear axle and 35 on the front. Throughout the best of material and workmanship are incorporated. A noteworthy feature is the employment of S. A. E. threads and all bolts are secured with castellated nuts and cotter pins. Five types of standard bodies are fitted, although the company



The Silent Crescent One-Ton Truck, Presenting Many Interesting Constructional Features Including Swinging Seats Permitting Easy Access to Power Plant.

is prepared to furnish special members according to the requirements of the purchaser. The guarantee is unusually broad, covering a period of two years.

Rutenber Motor Employed.

The motor employed in the one-ton model described and illustrated herein, is the well known Rutenber, designed especially for truck service. The cylinders are of the L head type cast separately of semi-steel, and a high grade material is utilized. These are cast from metal patterns on molding machines, insuring uniform thickness and water jacket spaces free from obstructions. Each cylinder is annealed to equalize all strains in casting, after which it is rough bored and tested under hydraulic pressure. After being seasoned properly, it is inspected and finished by internal grinding with water flowing through the water jackets during the process, insuring accurate results. The bore is 4.125 inches and stroke 4.25, giving a rated horsepower of 30 at 1000 revolutions a minute.

The pistons are cast of the same material as the cylinders and undergo the same treatment in finishing. The rings are of a tough, springy cast iron and alloy and are perfectly ground on the sides and outside. These are fitted accurately to the piston, lapped to obtain a smooth surface and split by a milled process. The wristpins are of seamless steel tubing, machined, hardened and ground, and tested with the scleroscope. The diameter is 1.25 inches and the bushings are of a high grade phosphor bronze, machined accurately and to a press fit. The bearings of these members are liberal, being 2.25 inches. The piston displacement is 280.6.

Liberal Sized Bearings.

The connecting rods are drop forged from a high grade steel. The upper end is split and the pin is retained in position by a clamping bolt, lock washer and nuts. Both the connecting rod and crankshaft bearings are made from a special Hoyt's alloy nickel babbitt, die cast, and have large oil grooves and heavy flanges. Five bearings are utilized for the crankshaft, the inside members being 2.125 inches while those at the flywheel and front end are 3.75 and 3.9375 inches, respectively. The crankshaft is 1.625 inches in diameter, is drop forged from 40 point carbon manganese steel, heat treated and balanced with and without the flywheel. The latter is 16.625 inches in diameter with a 4.875-inch face. The camshaft is drop forged, heat treated, carefully machined and case hardened. The integral cams are ground accurately from master members. The bearings are ample, of phosphor bronze, and are split in the centre for adjustment.

The timing gears of the crankshaft are drop forged from 40 point carbon steel, heat treated, while camshaft gears are cast of semi-steel. Both have helical cut teeth which assures quiet operation, as well as enduring qualities. The valves are ample in size, being two inches in diameter, of a high grade steel and both the intake and exhaust members are located on the left hand side of the motor. A feature of the valve operating mechanism is the design of the valve lifting arrangement. These components are constructed of a high grade material, hardened and ground, insuring an accurate fit and freedom from noise. A long steel guide is utilized, this eliminating side slap as well as making for a more satisfactory operating motor, as the valves seat properly and do not require frequent grinding. All valves are adjustable.

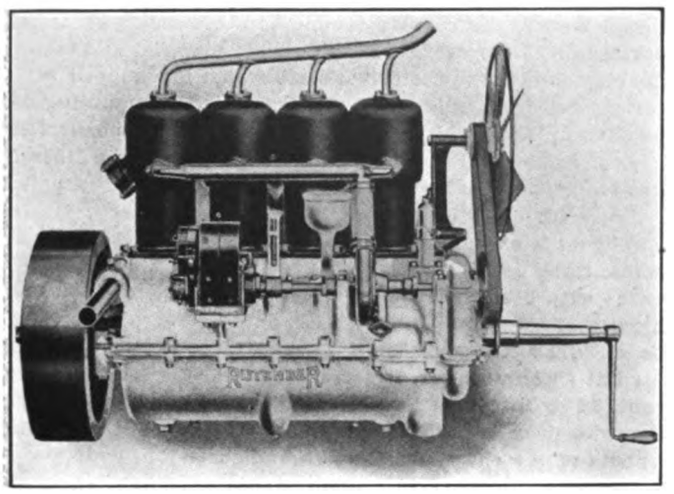
The exhaust and intake manifolds are located on the left hand side and are of liberal size and clean castings. Pipes are counterbored in each opening, as also are the cylinders, and a straight nipple is used in this counterbore. Copper asbestos gaskets are fitted between the cylinders and the pipes, and the latter are drawn up by tiebars on liberal studs, preventing auxiliary air or gas leaks. The water manifold is located on the right of the motor, of tapered brass tubing with cast flanges and these are attached to the cylinders by liberal studs.

Cooling and Lubrication.

The water pump is of standard brass gear design, on the right hand side of the engine, driven direct from the front end of the camshaft, and is fitted with extra long packing nuts, insuring a water tight member. It maintains positive pressure of water in all cylinders, with an even temperature of the fluid, and makes for efficiency of the motor.

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The oiling system of the Rutenber motor is well designed, the lubricant being maintained at a constant level at all times eliminating flooding of the working parts and



Presenting the Magneto Side of Rutenber Motor Fitted to the Silent Crescent Trucks.

smoking. The lubricant is circulated by a positive gear pump driven from the lower end of the commutator shaft, and being submerged in oil wear is reduced to a minimum. The lubricant is forced into the connecting rod pits, and there maintained at a proper level, the overflow being led to the lower reservoir. All oil is strained through a wire mesh before it enters the reservoir, which contains two gallons. The oil sight feed is located on the pump side, enabling the operator to note at a glance the amount of lubricant in the container.

The crankcases are made of a high grade aluminum, scraped and finished in natural color. They are well ribbed, and the lower half contains a separate compartment, cast integral, which is the oil reservoir. The oil pan may be removed easily by displacing cap screws at the centre line of the crankcase, this arrangement making for an easy inspection or adjustment of the bearings, etc. This also eliminates the necessity of removing the power plant from the frame.

A Werner riveted tube radiator is utilized, it being suspended by a spring device which absorbs road shocks. The filler cap is ample in size and very accessible. Cooling is assisted by a fan located on a swivel bracket, and a spring device is fitted for the purpose of maintaining tension. The construction is such that it may be removed easily.

A Remy magneto is the standard equipment although a Bosch or an Eisemann is furnished when desired. A model L Schebler carburetor is employed.

Clutch and Transmission.

The cone clutch is a taper cone and springs are utilized between member and friction band, these being adjustable. It is claimed of this arrangement that easy engagement of the clutch is possible, that slipping is eliminated and that the transmission is relieved of stresses in starting. Interposed between the clutch and the transmission is a universal coupling of rugged design. It is of the block tin type, with hardened and ground parts, and accurately fitted to prevent rattling. The square shaft construction is eliminated, the coupling being bolted to flanges keyed on shafts.

A selective sliding gear transmission, providing three speeds forward and a reverse, is employed and this is a unit with the jackshaft. A three point suspension is a feature, this arrangement relieving the parts of stresses encountered when traversing rough and uneven roads. The transmission gears are of chrome nickel steel tempered in oil and thoroughly tested and inspected before being assembled. They have ample sized teeth which are formed by the process of planing, making for durability, as well as quiet operation. All gears and bearings operate in a bath of lubricant and are very accessible.

The jackshaft is of a high grade material and of ample size and its driving sprockets have 14, 17 or 19 teeth, respectively, and are interchangeable, the combination meeting the requirements of different service. The standard equipment, however, is 18 teeth. The rear sprockets have 44 teeth and these members are also accessible and interchangeable. Final drive is by roller chains, these being .625 inch wide, 1.25 inches pitch and with .75 inch wide rollers.

Ample Brakes Provided.

Particular attention has been paid to the matter of brakes, an important factor in the operation of the industrial transport. The Liggett type service brakes are fitted to the rear wheels, operated by pedal, and the utilization of a well designed equalizer insures even pressure at both members. The brakes are 12 inches in diameter with three-inch face. The emergency members are Duplex fitted to the jackshaft and actuated by lever convenient to the driver. These are eight inches in diameter with two-inch face. The total braking surface is 300 square inches.

The front axle is of the I beam section type with bowed centre, and the spindles and knuckles are of liberal size. The adjustable tierod is located in the rear of this member, protecting it from road obstructions. The reach rod is also

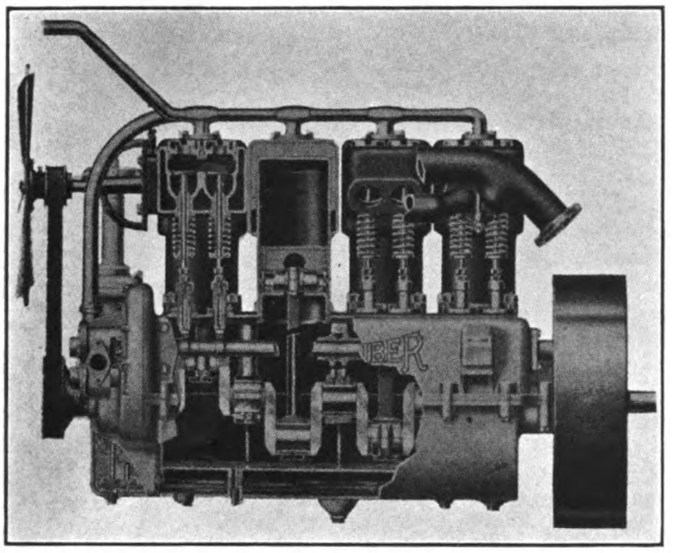


Depicting How Seats Are Swung to the Rear, the Operation Requiring But a Few Seconds, an Arrangement Making the Inspection of the Motor an Easy Task.

sturdy in design. The rear axle is 2.25 by 3.5 inches with 2.125-inch diameter wheel spindles. The wheels are of the artillery type, of carefully selected and seasoned wood, the

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front members having 12 two-inch spokes and the rear 14 two-inch spokes. Bower roller bearings are liberally employed. Solid single rubber tires are fitted, 34 by 3.5



Cross Section View of Motor Outlining Its Components and Oiling System.

inches, to both the front and rear wheels.

The company makes use of a full elliptic spring, both front and rear, believing that this design makes an easy riding vehicle and relieves the chassis components from stresses. The front members are 34 by two inches and the rear 40 by two. An auxiliary cross, semi-elliptic spring is utilized at the rear, this being 40 by 2.5 inches. The springs are of a high grade material, carefully tempered and the total spring surface is 336 lineal inches.

The wheelbase is 108 inches with tread standard, 56 inches. The frame is of five-inch channel with truss rods on the one and two-ton models while six-inch is utilized on the three-ton vehicle. The net weight of the chassis is 3600 pounds and the body carrying capacity back of the driver's seat is 48 inches wide and 108 inches long, or 60 by 108.

Control is by a lever centrally located. The emergency brake lever and service brake pedal are at the right of driver while the clutch pedal and differential lock are at the left. The latter is incorporated in the jackshaft unit and by it the axles may be locked, facilitating traction when the machine is operating in sand or on muddy roads. The spark and throttle levers are mounted under the 18-inch handwheel.

Motor Very Accessible.

Mention has been made as to the accessibility feature of the power plant. Two individual front seats move on tubing and are directly over the motor. This tubing permits of the seats to be pulled out 24 inches and by means of a hinge arrangement they may be swung backward and out of the way of the driver when an inspection of the power plant is desired. The seats when in normal position fit together accurately and are securely locked by a simple device. The maker points out that the operation may be completed as quickly as the unfastening of and lifting of the hood of the motor-in-front type.

Another feature of the Silent Crescent is the design of the radius rods. These members are very substantial and are hinged to the rear axle. Adjustment or alignment of the axle and chains is made possible by large bolts, which are threaded into an extension of the jackshaft housing and locked. Throughout, all parts of the chassis subject to friction are provided with liberal sized grease cups. In its design the company has given attention to the refinement of small details and all components of the chassis are noticeable for their accessibility and ease of adjustment.

The regular equipment comprises two side oil lamps, tail light, horn and a complete set of tools. One or two searchlights and a Prest-O-Lite tank are listed extra. Regarding special bodies, the company manufacturers any type at an increase of 10 per cent. over the cost of material and labor. The chassis includes the driver's cab which is equipped with storm front and a feature of the design is the mounting of the fuel tank over the radiator. This tank is of the riveted type, of substantial material and is provided with a liberal filling opening, facilitating the replenishing of the supply.

Other Models.

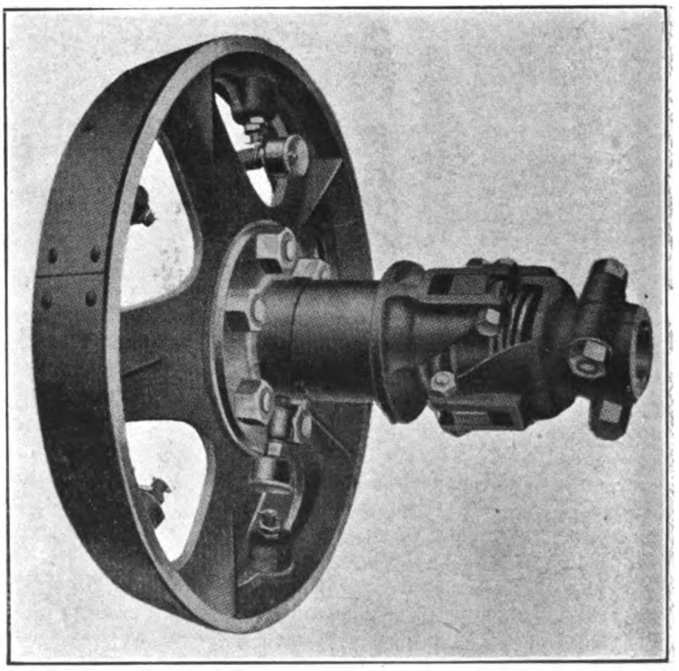
The two-ton model is also equipped with a Rutenber motor, rated at 35 horsepower and has a wheelbase of 126 inches with 60-inch tread. Solid single tires are employed in front, 34 by four inches, with dual at rear, 34 by 3.5 inches. The Rutenber motor of the three-ton machine is rated at 40 horsepower, and the car has single solid tires in front, 36 by five inches, and dual 36 by four inches at rear. The wheelbase is 136 inches and tread 62. Other components of the chassis of the two and three-ton models are strengthened to meet the requirements of a heavier load.

GEORGIA LEADS THE SOUTH.

The federal bureau of statistics, a short time ago, reported that Georgia led the southern states in building of good roads, and now comes an equally interesting announcement that the state has twice as many automobiles as any of its southern neighbors. There are 14,000 motor vehicles in the state, 7000 in Tennessee, 4000 in Alabama (two months ago), 2000 in Arkansas, 5000 in Florida, 4000 in Kentucky, 4000 in North Carolina, 4500 in Virginia and 2000 in Mississippi.

MORE MOTORS FOR NEWCASTLE.

Newcastle, Penn., is to add several pieces of motor drawn apparatus to its fire fighting equipment. Automobile engines have given such satisfaction in that city that it has



Clutch and Universal Coupling of Silent Crescent, the Latter Being Bolted to Flanges Keyed to Shafts.

been decided to purchase an automobile for the chief of the department, an automobile truck and combination chemical and hose wagon.

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WHITE TRUCK IN GLOUCESTER.

In order to facilitate deliveries at Eastern Point and Bass Rocks, two summer resorts, the Presson Express Company, Gloucester, Mass., recently purchased a White truck, made by the White Company, Cleveland, O. The body was built and the painting done by a Gloucester firm. The truck was one of the first to make its appearance in the town, and the probabilities are that the express company will eventually do away entirely with its horse drawn vehicles.

NEW KNOX COAL DUMPER.

The Fall River Iron Works, Fall River, Mass., which, by the way, manufactures cotton cloth, although it was organized as an iron concern many years ago, has just taken delivery of the seven-ton Knox coal dumping truck shown in the accompanying illustration. The car was made by the Knox Automobile Company, Springfield, Mass., and is in some respects a decided departure from previous models produced by this maker.

Perhaps it ought to be stated in this connection that the Fall River Iron Works began experimenting with Knox trucks about 18 months ago. The vehicle it has had in service replaced three double teams in the work of hauling completed materials from the factory to the plant of the United States Finishing Company, which takes all the goods manufactured by the Fall River Iron Works.

The distance covered between the two plants is only about .375 mile, necessitating many stops during the day. Something like 14,000 pieces of goods are transported daily, this work being accomplished in 16 or 17 loads. Three men accompany the Knox car, the goods being handled on small trucks, which are wheeled on and off the larger vehicle.

So successful has been the work of this first Knox truck that no other make was considered when it was decided to secure a larger car for the transportation of coal. The Knox company was furnished with the demands of the work contemplated and the entire construction of the vehicle presented herewith was accomplished in the Springfield factory.

It will be noted that although this truck is of seven tons capacity the dumping arrangement is operated by hand, and it is claimed by the company that the mechanism was designed and built so the windlass would afford a very powerful leverage with minimum friction. The chassis is fitted with a short wheelbase, so that the dumping body permits a satisfactory balance of the load, thereby facilitating delivery. The body itself is made of heavy oak panels, strongly reinforced with metal sides on the exterior, and is flared toward the rear to prevent the coal from packing when being dumped.



Interesting Coal Dumping Body Fitted to Seven-Ton Knox Chassis Recently Delivered in Fall River, Mass.

FIFTEEN G. M. C.'S FOR BOSTON.

The Shepard-Norwell Company of Boston, Mass., one of New England's oldest department stores, will abandon its horse drawn delivery system. Manager Ketcham recently placed an order with the General Motors Truck Company, Detroit, for 15 1.5-ton gasoline trucks. The firm placed an order for 10 machines at first, deciding to keep a few of its horse drawn vehicles for a time, at least, but further consideration resulted in an order for an additional five machines before the first had been delivered.

MACK IN WEST VIRGINIA.

The first delivery motor truck to be used by West Virginia merchants was recently put in commission by House & Herrmann, located in Wheeling. It is one of three to be used by the firm in distributing goods in the country, and is a Mack of 2.5-tons capacity, made by the International Motor Company at its plant in Allentown, Penn. Eventually the firms plans to entirely do away with the use of horses, both in the country and city.

PEERLESS FOR COAL DELIVERY.

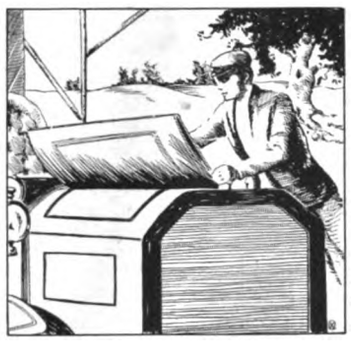
Delivering 60 tons of coal in 9.5 hours is the record of a Peerless truck, made by the Peerless Motor Car Company, Cleveland, O., in a recent test at Worcester, Mass. The truck had a special body, unloading mechanically without the aid of shovels. The coal was hauled from the yards to the State Hospital and the Worcester Technical School. Speaking of the action of the body one of the Worcester papers said:

"Arriving at the hospital the driver, without leaving his seat, tripped a small lever and instantly the body started up in the air and simultaneously travelled and tilted toward the rear. When the load was out bystanders were astonished to see the truck start immediately on its return with the body still in its unusual position. But they were promptly relieved to discover that while the truck was under way the body was descending. It settled quietly into its place before the truck had gone 300 feet."

TRUCK IN PLACE OF MULES.

The Home of the Good Shepherd, Wheeling, W. Va., has received a large delivery truck for use in connection with the work of its laundry. The vehicle takes the place of several mule teams, and if found efficient, plans will be made to add a number of others to the equipment of the institution.

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HINTS·FOR·PROPER MAINTENANCE

A Department for the Owner, Driver and Repairman.



G. C. HEAVY FUEL VAPORIZER.

The progress of engineers and individuals in developing a practical device which will vaporize kerosene or heavy fuels for utilization with the internal combustion motor is of special interest to those identified with the commercial vehicle industry. The advantages of such a vaporizer would be more readily appreciated in foreign countries, especially in the tropics where the price of gasoline is prohibitive and where kerosene may be considered a household necessity and therefore more readily obtained and at a less cost than the lighter fuel.

A vaporizer which has been fitted to a number of large trucks in the service of an English company is the G. C., marketed by the British and Colonial G. C. Syndicate of London, England, and it is stated that it has given satisfaction, as well as greater mileage to a given quantity of fuel as compared with gasoline.

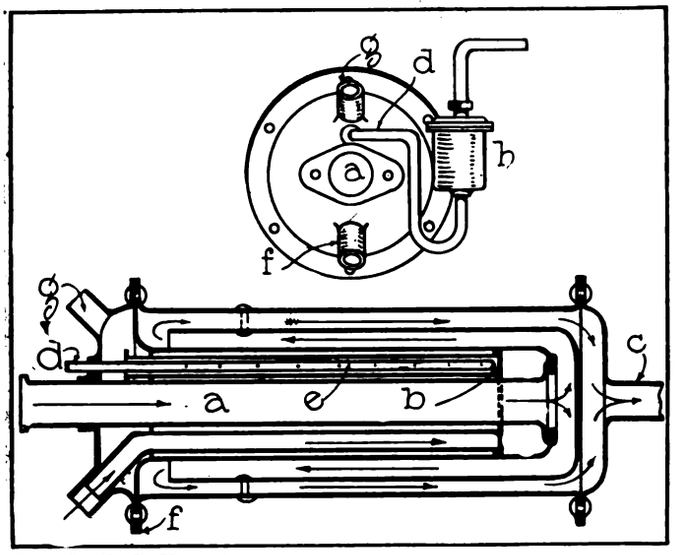


Fig. 1—G. C. Vaporiser for Utilisation of Kerosene and Heavy Fuels, Which Is Simple in Construction.

It is the invention of a young Roumanian engineer, who through having been associated with the development of the various oil fields in his native land, has been in a position to gain valuable knowledge regarding the nature of mineral oils. The vaporizer, which is depicted at Fig. 1, is constructed in combination with the muffler, and as will be noted by the sectional and elevation drawing, is simple in design. It may be utilized in place of the muffler if desired.

The heated exhaust gases pass from the exhaust pipe into a central pipe a, which is gilled on the outside and has strips of brass secured to it longitudinally. In the sketch these details are not shown. The object of this arrangement is to retain the heat, as well as to maintain that of the vaporizing chamber b at an even temperature. After flowing through this chamber the gases pass back along the outside of this member and eventually find egress at the outlet c. The fuel to be vaporized enters at d and is conveyed through a long perforated tube e inserted in the vaporizing chamber.

When the motor is operating, the temperature of this chamber is stated to be maintained at between 500 and 600 degrees Fahrenheit. A certain amount of air is utilized in the vaporization of the fuel. The atmosphere enters at a connection f at the end of the vaporizing chamber, and as it is heated it mixes readily with the vaporized oil, forming an explosive mixture which is drawn into the cylinders through the outlet g.

An auxiliary air inlet is fitted to the intake pipe, it being employed to obtain the correct mixture, as well as maximum power. The flow of the fuel is controlled automatically by the speed of the motor through a simple device, this consisting of a vessel h, which is similar to the usual float member and which has a glass gauge for noting the level of the oil. Inside of vessel is a jet, consisting of a piece of .25-inch copper tubing slotted some distance down on each side by a saw cut about .0625 inch wide. An adjustable valve is provided for controlling the flow of the fuel to this feed regulator, and this is set to meet the demands of the motor when the latter is operating at its maximum. Adjustments may be made when the engine is running, the operation being simple, it is stated.

As generally is the case with heavy fuel vaporizers, the G. C. device must be heated to a certain temperature before the heavy fuel can be utilized and the motor operate successfully with it. This is accomplished by running the engine upon gasoline for a few minutes, after which the heavy fuel is brought in service. It is stated that outside of one or two backfires or premature explosions, caused by the manipulation of the auxiliary valve, the motor will operate successfully with oil.

SPARK PLUG AND VALVE GAUGE.

The ingenious operator who cares for his truck will construct a number of useful devices from broken and discarded tools which have been consigned to the scrap heap. Old files are converted into bearing scrapers, cotter pin pullers, etc. Broken hacksaw blades are rarely saved, especially if the pieces be small, but even these may be turned into useful tools.

At Fig. 2 is outlined how a driver utilized a small piece of an old hacksaw blade. The piece was about 1.5 inches, and its thickness was exactly .03125 inch. This was about the right gap for the spark plug and was employed when setting the points as shown at C. It was also noted by the driver when adjusting the space between valve tappet and stem, the distance was .03125 inch, so the tool served for setting the valves without utilizing the marks placed

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upon the flywheel for this purpose by the manufacturer.

As the motor of the truck was fitted with two separate sets of plugs, one being supplied by current from a mag-

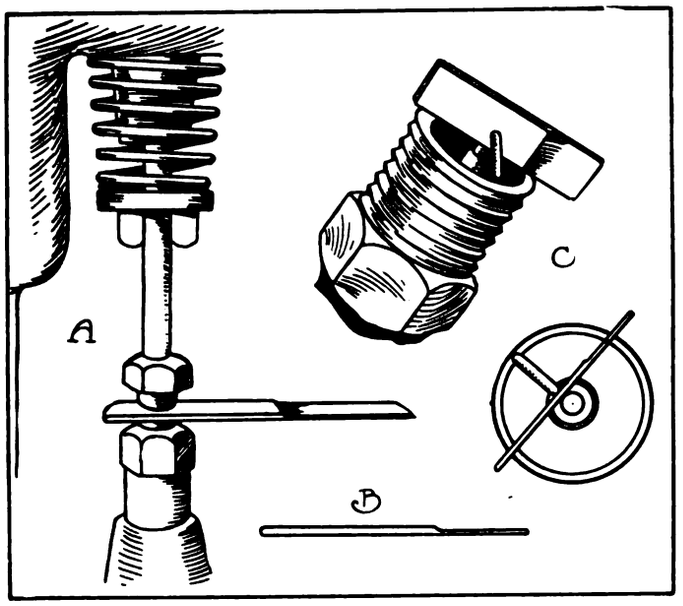


Fig. 2—Home Made Measuring Tool Constructed from a Piece of Hacksaw Blade, and Depicting Some of the Uses to Which It May Be Put.

neto, the other end of the hacksaw blade was ground down to .015625 inch, as indicated at B. The rough ends and teeth were removed by grinding on an emery wheel. The device could be arranged so as to provide a measuring gauge by fastening together two or more of these members, which would enable measurements to be made from .015625 up to .125 inch.

CUTTING THREADS ON SMALL SCREWS.

In many shops only long screws are carried and when a short one is desired the threads are cut up to the head and the extra length cut from the thread end. When this is done by holding the screw in a vise and using cutters or a hacksaw, considerable filing is necessary to restore the threads to their original condition. The extra work may be eliminated by the following method:

A die the same size as the thread is fastened into the holder and the stock clamped in the vise. The screw is threaded into the die, a screw driver being utilized to force it through, cutting the threads on the shank. After cutting off the extra length the screw is backed out, the die forming the threads back into shape.

At times the screw will twist when cutting threads on the shank, especially the smaller sizes. This can be prevented by catching the threaded end in the vise after starting the die and holding the head from twisting with a screw driver while the die is being turned.

HOME MADE COMPRESSOR.

Some drivers take pride in maintaining the power plant in first class shape, and upon request like to lift the hood and show the motor with its brass connections highly polished and all exterior parts free from dirt and grease. This means considerable labor unless the work is performed at stated periods. Many operators of commercial vehicles graduate from the ranks of pleasure car drivers and some are very handy in constructing devices for making easy the maintenance of the industrial transport, when placed in charge of trucks.

At Fig. 3 A is depicted a compressor made by a driver for removing grease and dirt from the chassis. The material was inexpensive and some of the parts were secured in the garage. It was constructed by taking a galvanized tank and soldering a tube into it at the top and another at the bottom as outlined. These members were fitted with valves and joined. The hose was of sufficient length to permit of the use of the spraying nozzle without moving the tank, and the size tubing utilized is known as .375 inch. Attached to it is a nozzle with a .25-inch flared outlet. An old bicycle pump connected to one side of the tank, and a pressure gauge completed the device.

In service, a gallon or more of gasoline is poured into the tank and the pump operated to obtain a pressure of several pounds. The valves are then opened to permit a small quantity of the fluid and air to flow, producing a spray or vapor which will remove all grease and dirt easily and quickly, it penetrating to places not accessible with the ordinary brush.

CONE CENTRE DIVIDERS.

A tool that will be of service when scribing accurate lines around holes or centres is outlined at Fig. 3 B and consists of the clamping sleeve and needle of a regular surface gauge, and a hardened centre box having a 60-degree cone at the lower end. The centre bar may be made of drill rod and of the size of the surface member, so that the sleeve will fit. When the holes to be used as centres are larger, a .3125-inch ball is employed. This has a 60-degree centre made in one side as depicted. The sphere is magnetized so that it will not fall off when being placed in position. This device will prove useful for all around work.

THREAD CUTTING KINK.

When cutting threads on brass rods or pipes, the dies have a tendency to squeak. A solution of very strong soap suds applied to the metal will reduce the noise as well as the friction.

MARKING STEELS FOR STOCK ROOM.

System in the stock room is a valuable asset. Various grades of steel are utilized in the repair shop and it is an excellent idea to adopt a method of marking each separate

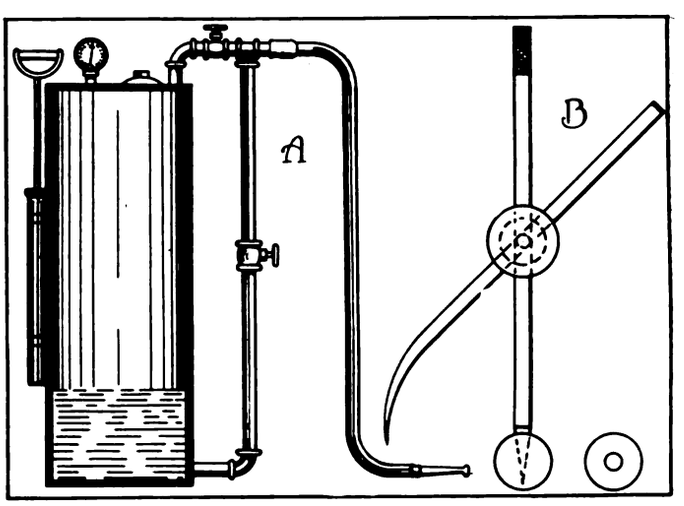


Fig. 3—Suggestions for the Garage and Repair Shop: A, Easily Constructed and Inexpensive Gasoline Compressor; B, Cone Centre Dividers.

brand so that the workmen will be able to recognize them without the fire and water test. A way to insure against difficulty arising from mistakes in using the wrong brand

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of steel is to have each brand or grade striped with a different colored paint. An index board bearing the colors of the steel can be made easily and hung on the rack containing the material. By this system the brand of steel required can be located quickly and with certainty, and in addition, with a considerable saving in time.

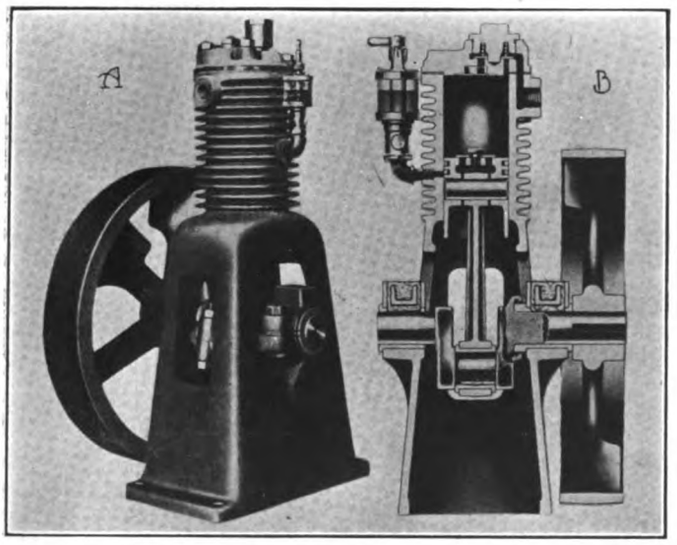


Fig. 4—Curtis Air Compressor Adaptable for the Public or Private Garage and Service Station.

CURTIS AIR COMPRESSOR.

The increasing number of light delivery automobiles is of value to the public service station, and many concerns maintaining one or two machines prefer to garage the cars in preference to taking over the care of the vehicles. As pneumatic tires are generally employed on the light machines, it is obvious that to give the customer efficient and prompt service the garage must be equipped with a tank of compressed air or other suitable means for the quick inflation of tires.

The Curtis & Co. Manufacturing Company, St. Louis, Mo., is marketing an air-cooled compressor which is produced in two sizes, having a bore and stroke of two by 2.5 and three by 3.5 inches, respectively. The device is depicted at Fig. 4, A and B, the latter view outlining its construction. Water-cooled types are also made, these having a bore and stroke of three by 3.5, 3.5 by 3.5 and four by 4.5 inches, respectively. Either design lends itself readily for belting directly either to line shaft or motor.

The pump is vertical of the up-plunger type, and it is stated that this construction eliminates grease or oil from being carried over into the receiver and thence to the tires. Several new features are emphasized of the compressor, these including a springless inlet valve on the piston head, fan shaped arms on flywheel which direct a current of air onto the cooling fins, etc. Lubrication is by a gravity feed oil cup on the side of the cylinder, the device supplying oil to the piston and wristpin. The crankshaft is of ample dimensions and throughout the best of material and workmanship are incorporated.

SEBASTIAN LATHE.

Many repair shops and private garages which formerly sent machine work outside have installed lathes, an arrangement which not only facilitates the repair of motor cars, but permits of the completion of rush work, which is not always possible when outside shops have to be relied upon to finish certain parts. The Sebastian Lathe Company, Cincinnati, O., makes a specialty of lathes and tools and at Fig. 5 is presented a 15-inch lathe made by this concern which is low priced and of high grade material. It is designed especially for the repair shop as well as garage, has screw, rod and power cross feeds and cuts standard threads with furnished gears from five to 36.

The head stocks are strong and solid and the spindles are hollow, constructed from a high grade steel and operate in phosphor bronze boxes. The cone pulleys have four steps and with back gear give eight changes of speed. The tail stocks are of the cut-under pattern, allowing the compound rest to swing parallel with the ways and over the base of the tail stock, with room to operate the feed screw handles. They have adjustable side movement for taper turning, heavy spindles and self-discharging centres. The carriages are of the most approved design, rigid and substantial and T slots are arranged in both front and rear arms of the carriages.

When it is desired to use only the cross feed, the carriages may be clamped very solidly to the bed by a simple device. The cross feed screws are graduated to .001 inch. Plain or compound rests are supplied and these are interchangeable. The tool posts are cut from a solid bar and the lead screws are cut carefully from a master screw, insuring accuracy. The countershafts have improved friction clutch pulleys with large surfaces, and ample provision is made for lubrication. The pulleys of the countershafts are nine inches in diameter with a three-inch face and are designed to run at 190 revolutions a minute.

The dimensions of the lathe are as follows: Swings over bed, 13 inches; swings over carriage, 7.5 inches; length of bed, six feet; takes between centres, 40 inches; diameter of spindle nose, 2.125 inches; threads of spindle nose, eight inches; hole through spindle, 1.3125 inches; size of tools, .5 and one inch; ratio of back gear, 7.5 to one; diameter of tail spindle, 1.5625 inches; compound rest travels, 4.25 inches; capacity of centre rest, 3.5 inches. Hand rest and chuck plate are extra. A set of 10 tools is supplied with the lathe.

BENDING LIGHT TUBING.

To bend brass tubing without kinking requires considerable care. Where small tubing is to be shaped, take a close spiral spring that will make a neat, sliding fit in the tube, and anneal it at the part to be bent. Next take a piece of hard wood and make a form about which the tube

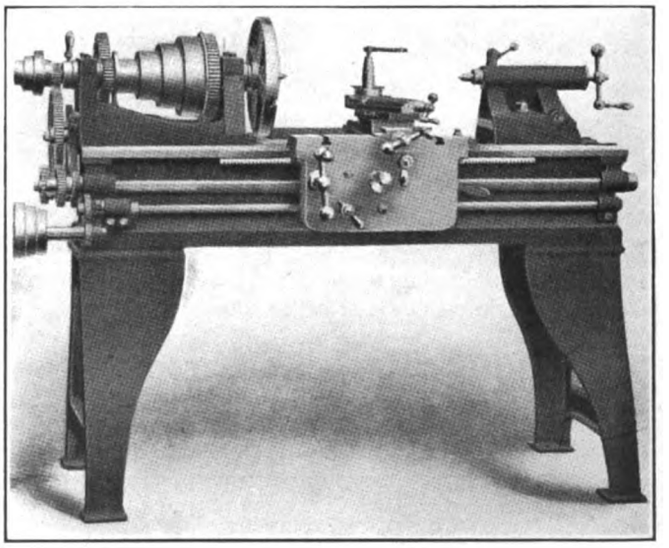


Fig. 5—Sebastian 15-inch Lathe Designed Especially for Motor Car Work and Constructed of High Grade Material.

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is to be shaped. To remove the spring after the bending process, twist it in the direction in which it was wound. This will serve to close the spring slightly so that it can be taken out easily. This kink may be used on tubing up to .75 inch in diameter.

DECARBONIZED STEEL SURFACES.

A fact that is not generally known and one that would save considerable trouble is that the surface of all steels as they come from the manufacturer is decarbonized and, of course, will not harden. This condition cannot be overcome in the present manufacture of steel, as the action of the oxygen in the air affects the metal in such a manner while being put through the various processes required in its production, as to burn out the carbon in the surfaces. For this reason it is not good policy to select a piece of steel which will just "skin" up, but to choose one large enough to require a good sized cut before reaching the finishing surface.

CLEANING STEEL RULES.

Steel rules that have become dirty and rusty, making it difficult to read fine divisions, can be cleaned by covering with oil, and rubbing down with No. 0 steel wool. This will remove the rust without injury to the markings. If but slightly discolored, they may be brightened by using powdered pumice.

DRAWING TEMPER FROM BRASS.

Brass is rendered hard by rolling or hammering. Temper may be drawn from brass by heating it to a cherry red and plunging it into water, as though steel were to be tempered.

LUBRICANT FOR OIL STONES.

A good lubricant for oil stones is made by taking one part sperm oil and one part kerosene mixed, or if desired two parts kerosene may be used.

CORRESPONDENCE.

Wiring Master Vibrator.

(4)—I have a four-cylinder pleasure car which I have built over for service in light expressing. The ignition is by a four-cylinder coil, timer and batteries, but I find that the cells do not last very long. Have tried to adjust them so as not to draw an excess of current, but the motor skips unless the contact screw is turned down snug. Would a master vibrator save current, and how should one be wired? L. F. T.

Cleveland, O., June 23.

The installation of a master vibrator would not only save current, but the operation of the motor would be improved, as the device synchronizes the ignition. At Fig. 6 is presented the wiring diagram which is self-explanatory. The K-W Ignition Company of Cleveland, O., manufactures a master vibrator which is designed especially for the class of work referred to. In fitting the member it is very important that the vibrators on the four-unit coil be short circuited and this is accomplished by shunting the circuit by the utilization of a copper wire connecting the vibrator and the primary terminal, as outlined in the drawing.

Cleaning and Lubricating Chains.

(5)—What is the best method of cleaning and lubricating chains? I drive a four-ton truck and cover considerable territory where the roads are bad, and often muddy. The chains become dirty. Is it necessary to remove them from the car to clean off the dirt? CONSTANT READER.

Fall River, Mass., June 24.

Some drivers clean the chains when on the machine, but this is poor practise as the cleansing fluid percolates in between the rollers and bearings, carrying with it the grit and dirt and increasing the wear. The chains should be removed and immersed in a can of gasoline or kerosene and worked until all grit and dirt is removed. They should then be placed in a vessel containing a mixture of beef or mutton tallow, to which a quantity of powdered graphite is added, placed over a slow fire and boiled. The chains are then removed and hung up to cool. This mixture may be used from time to time, and may replenished as required. It will be found that the tallow will penetrate between the rollers and bearings, not only lubricating these members but will also serve to exclude dirt and mud, adding to the life of the chains and sprockets.

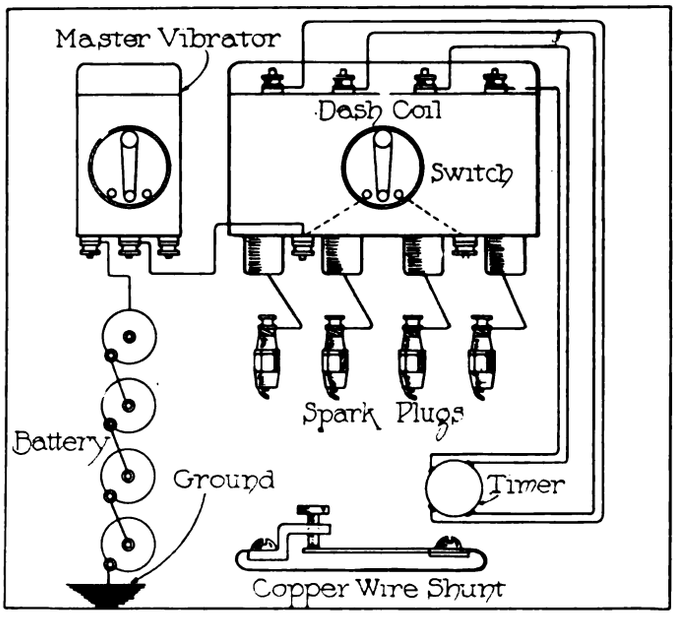


Fig. 6—Depicting the Installation of a Master Vibrator in Connection with a Four-Unit Coil, Timer and Battery.

Install a Governor.

(6)—Am having trouble with my driver overspeeding truck and although I have not been able to catch him, am informed by business acquaintances that he races the machine when returning with the car empty. Have been told that a governor could be fitted, but could not the device be tampered with? OWNER.

New Haven, Conn., June 28.

Overspeeding is one of the evils which the owner of commercial vehicles should suppress. Many manufacturers equip their machines with governors and these are sealed so that in the event of the operator tampering with them it is an easy matter to note his work. The make of car was not stated, but a governor could doubtless be so installed that the operator could not change its setting without breaking the seal. This alone would convict him. The maker of the automobile could supply the information desired.

A new two-ton Knox truck, made by the Knox Automobile Company, Springfield, Mass., was delivered to the Nelson Manufacturing Company of East Swanzey, N. H., a short time ago. The machine will be used in hauling goods to and from the depot, and in transporting stock from Gilsum to the factory.

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STANDARD MOTOR TRUCK WARRANTY.

THE National Association of Automobile Manufacturers, Inc., at a recent meeting in New York City passed a resolution adopting unanimously a standard motor truck warranty and a standard form of caution plate. The action followed a one-day meeting of commercial motor vehicle manufacturers. The warranty is the same in intent as the form recommended by the first convention of the trade held last March, but has been rearranged and altered to make it acceptable to the largest possible number of truck makers. The wording of the recommended caution plate is as follows:

CAUTION.

Overloading or Overspeeding Will Void Your Warranty.

..... Ton Truck.

No. .... Speed ..... Miles Per Hour.

	Standard	Actual
Weight of chassis.....	..... lbs.	..... lbs.
Body weight allowance.....	..... lbs.	..... lbs.
Useful load capacity.....	..... lbs.	..... lbs.
Total weight, chassis body and load not to exceed.....	..... lbs.	..... lbs.

Name of Manufacurer.

It is intended that this plate shall replace the name-plate on the dash, and shall be attached to the back of the driver's seat or in some other place where it will confront the man who loads the vehicle. It will have a threefold purpose—to warn against the most common abuses; to exert a moral effect upon the body builder to keep the weight of the body down as nearly as he can to the standard body weight allowance, and to have a record on the machine of the total weight with load so that a "scout" for the truck maker can, when he observes a flagrant case of overloading, have the truck driven to the scales and check up the actual weight with the figures on the caution plate.

Of the reports to the convention one of the most interesting was that of the committee on production, appointed at the first gathering of commercial vehicle men. The statistics showed blanks filled out and returned by 82 companies, which gave a total of more than 18,700 commercial motor vehicles built and sold up to the beginning of 1912. These represented a total valuation of more than $36,000,000. Calculated from the reports received, the production last year exceeded in value by 40 per cent. the manufacture and sale of such machines during all the previous years. This remarkable showing is believed to be due, however, to the difficulty of getting records dating back a decade or more in a number of cases, particularly where companies have been merged, reorganized or gone out of business.

The work of collecting these statistics is far from complete, however, as at least a score of well established companies, including some of the largest manufacturers, made no returns, from which it is believed that the figures given do not represent more than two-thirds to three-quarters of the actual output.

Progress made in the investigations into heights of frames and platforms from ground, wheel diameters and tire sizes, and proportion of useful load to chassis weight, had not developed any conclusions on which recommendations for standardization seemed advisable.

That there might be no confusion or duplication of the work of standardization, there was a meeting of the commercial vehicle committee and President H. F. Donaldson, General Manager C. F. Clarkson and W. P. Kennedy, chairman of the trucks standards committee of the Society of Automobile Engineers, preceding the convention, at which a clear understanding was reached regarding the lines along which the two organizations should work. It was decided that the N. A. A. M. should take up such subjects as pertain especially to or affect the selling of trucks and their use by the purchaser, while the S. A. E., working in harmony, shall give attention to the structure of the vehicle and its units with a view to more economical production, improvement in design and construction.

It was the consensus of opinion that insurance rates, both fire and liability, are too high, and the whole subject, including a proposal by an independent company of lower rates than those usually quoted, was referred to J. S. Marvin, assistant general manager of the N. A. A. M. The next session will be held Nov. 7.

Those present were: S. D. Waldon, chairman, Packard Motor Car Company; A. F. Mais, Studebaker Corporation; William H. Brown, Mais Motor Truck Company; Edward R. Hewitt, International Motor Company; C. A. Neracher, Gramm Motor Truck Company; F. R. White, Baker Motor Vehicle Company; F. I. Harding, Peerless Motor Car Company; A. M. Chase, Chase Motor Truck Company; E. W. Curtis, Jr., General Vehicle Company; Alfred Reeves, United States Motor Company; Arthur W. Robinson, Locomobile Company of America; C. P. Morton, Packard Motor Car Company; O. S. Goan, Alden Sampson Manufacturing Company; H. S. Stebbins, General Motors Truck Company; Walter C. White, White Company; C. H. McCausland, Kissel Motor Car Company; M. L. Pulcher, Federal Motor Truck Company; Harold L. Pope, Pope Manufacturing Company; H. Kerr Thomas, Pierce-Arrow Motor Car Company; Morris R. Machol, Hydraulic Truck Sales Company; J. S. Marvin, N. A. A. M.

BUYS ATTERBURY TRUCK.

The firm of Carney, Jackson & Mullen, Parkersburg, W. Va., recently placed in commission a 1.5-ton, 30 horse-power truck, made by the Atterbury Motor Car Company of Buffalo, N. Y. The vehicle is to be used in making deliveries of furniture in the outlying district, and if found satisfactory, the purchaser plans to replace other horse drawn equipment with similar transports.

TAXICAB BUSINESS SOLD.

Taxicabs Limited, of Toronto, Can., formerly the Berna Motor Car & Taxicab Company, with a fleet of 30 machines, recently changed hands. George W. Verral, president of the Verral Taxicab Company, assumed control by purchasing the majority of the stock. Mr. Verral will add the cars to his fleet, making a total of 50 which will be operated by the Verral interests.

COLVER WITH LOCOMOBILE PEOPLE.

Fred F. Colver has been secured by the Locomobile Company of America, Bridgeport, Conn., to have charge of its truck department in the New York branch, and to also have charge of the truck business in the surrounding territory. Mr. Colver is well known in New York, having been in the automobile business for about eight years. He has been connected with the Pope Manufacturing Company; was manager of the Buick Motor Company's Brooklyn branch and was assistant sales manager of the Studebaker Corporation's New York branch.

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New Commercial Car Accessories

Tri-Radiant Fixture.

The Lenhart Manufacturing Company, Philadelphia, is manufacturing and marketing an attachment for acetylene lamps of which it is claimed that considerable more light is to be had without undue consumption of gas. Three burners are utilized and so arranged that the maximum efficiency of the reflector is secured. The two outer burners are so constructed that they may be used or cut out as desired by the operator. The fixture is substantially constructed and nickel plated throughout.

Daisy Lighter.

The Empire Self-Starter Company, New York City, is marketing a device for lighting the acetylene headlights from the seat, the operation involving the opening of a valve member and the pressing of a switch plug. It differs from the usual lighting devices of this nature as the ignition system is utilized to furnish sparks at the burners. The operating and controlling mechanism is neatly enclosed in a small brass case which is secured to the dash, and three leads are employed for connecting the gas tank and headlights. The device is fitted with a needle valve member by which the flow of acetylene may be controlled instantly. The Daisy lighter is not only inexpensive, but is attached easily.

W. & B. Self-Closing Waste Can.

Old waste saturated with oil and grease should not be left around the garage as the material is liable to ignite through spontaneous combustion. The Wilson & Bennett Manufacturing Company, Chicago, is marketing a can for oily waste that differs from those of ordinary construction, inasmuch as it is self-closing, and it is claimed by the maker that it is impossible for the cover to be left open. It is constructed of heavy material, mounted upon substantial legs and is made in different sizes to meet requirements.

Rudell Gasoline Register.

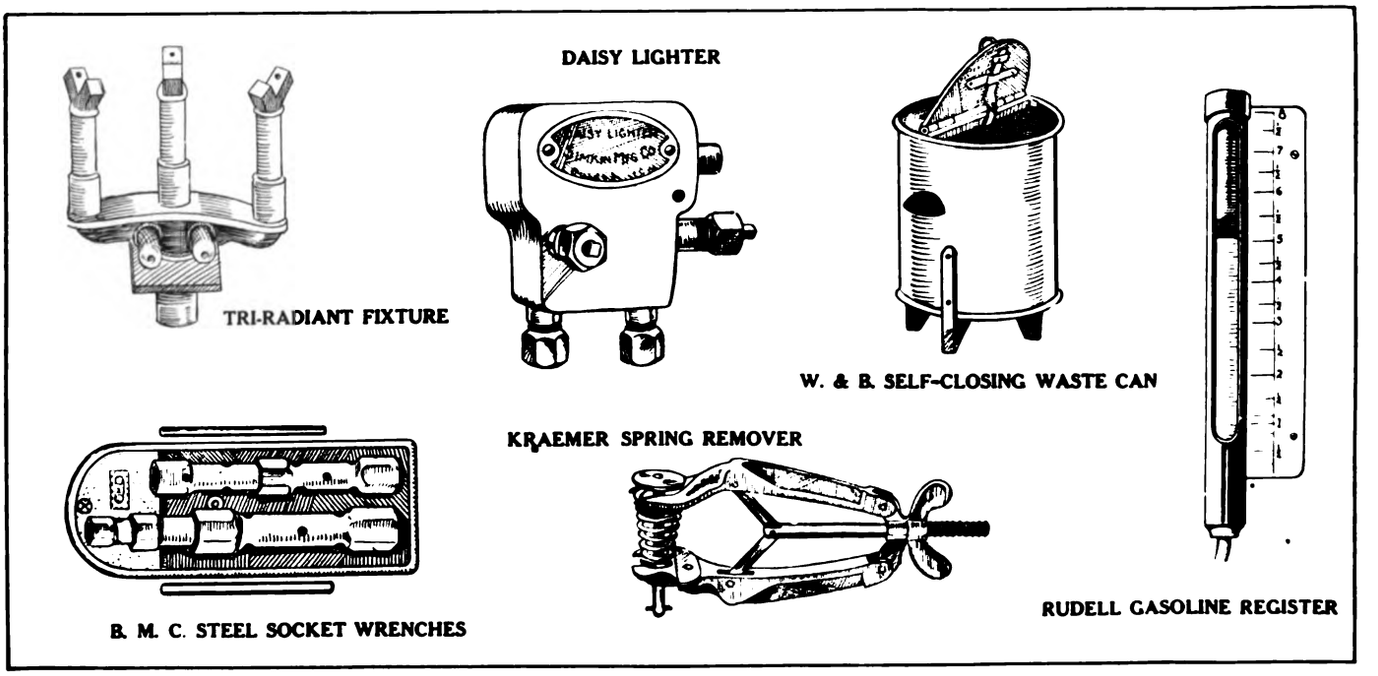
In the economical operation of the commercial vehicle the cost of fuel is a factor and a device which not only registers the amount in the container and that utilized, but measures the gasoline poured into the tank, is the Rudell gasoline register, made by the California Novelty Art Company, Los Angeles, Cal. It differs from those of usual construction as it is not dependent upon floats, springs, etc., for its operation. It comprises a glass gauge tube enclosed in a metal tube which is attached to the dash or any other convenient place. The tube is equipped with a calibrated dial denoting fractions of gallons, and the figures are read easily. A feature of the register is its ease of attachment, it being claimed that it may be fitted in 20 minutes, the operation involving the incorporation of a T in the line or the tubing to the fuel container.

Kraemer Valve Spring Tool.

One of the difficulties experienced in removing valves from the motor is that of compressing the spring and retaining it while the cotter pin or key is withdrawn. The United States Compass Company, Cedarburg, Wis., is marketing a device called the Kraemer spring remover which presents practical features inasmuch as the valve spring may be maintained in a compressed position, a feature facilitating the work. It comprises a pair of jaws pivotally mounted and these are actuated by a threaded bolt operated by a wing nut. Movement of this bolt opens or closes the jaws, compressing or relaxing the valve spring as desired. The device is said to be applicable to any type of motor.

B. M. C. Socket Wrenches.

Socket wrenches are a valuable acquisition to the tool kit of the motor car as well as the garage, as by them nuts and bolts difficult of access with ordinary tools are reached easily. The Braunsdorf-Miller Company, Elizabeth, N. J., is manufacturing socket wrenches made of steel tubing and these come in sets of five having 10 openings for standard cap screws and hexagonal nuts. The instruments are strong and light and come in suitable cases. Sets of different sizes also are marketed and are inexpensive.



New and Novel Accessories Including Acetylene Lighter, Valve Spring Tool, Self-Closing Waste Can, Gasoline Register and Triple Gas Burner.

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The MOTOR TRUCK
Devoted to Motor Driven Business Vehicles of All Classes.

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INFLUENCE OF MOTOR TRUCK.

Economists assert that whatever tends to make mankind think is of material worth. In this respect, at least, the mechanical transport already has added substantially to the economic wealth of the world. Certain it is that business men have begun to think since they have been brought face to face with the transportation problem in its new phases.

In the old days, when horses were employed because they always had been employed, little thought was expended upon either the economy or the efficiency of the delivery system. At present, it is not enough for the business man to know that he can save money by the use of the commercial vehicle, but he is anxious to obtain maximum efficiency as well. This view is extended to all branches of the business, and in this manner the motor truck is indirectly responsible for reforms all along the line.

In an effort to measure the sum total of economic wealth represented in the growing use of the industrial transport, it will be found that several kindred industries are being fostered, in exactly the same manner as was true with respect to the so-called pleasure vehicle. This is apparent particularly in the body building business, and some very interesting solutions to the various problems offered are being presented.

Those who are at all concerned with the study of progressive methods will do well to watch the influence of the motor truck upon the future of the world's industries. The surface only has been penetrated at present, and even those who feel best informed, are by no means able to indicate the hidden possibilities.

THE FARMER'S PROBLEMS.

The use of the internal combustion motor on the farm is by no means new. The stationary engine has played a prominent part in reducing the drudgery of farm work for some few years. It is not at all surprising, therefore, that the motor truck in its various applications is meeting with ready acceptance in agricultural districts.

Until recently, it was generally supposed that the gasoline, or kerosene, tractor was destined to be employed on the large farms of the Middle West and Canada, almost exclusively. It now develops that the manufacturers are turning their attention to the so-called small farm, and with the result that might be expected. Once the possibilities in this field are made manifest, it is self-evident that the interest awakened will be in the same proportion as that represented in other lines of endeavor.

How far reaching this situation will be is indicated by the numerous agricultural trials contemplated during the present summer. Canada will hold its annual plowing contest during the progress of the Canadian Industrial Exhibition at Winnipeg this month. Argentine Republic already has a similar event under way. Trials also are to be held in France, Austria and other Continental countries. In each instance the national government has taken a lively interest in promoting the affair. The United States appears to be one of the few nations which are not actively engaged in this attempt to solve the farmer's problems.

SENSING INDIVIDUAL NEEDS.

That the business of selling commercial vehicles is in radical contrast with the pleasure car lines has been evident almost since the very inception of this branch of the industry. Only those salesmen who have been able to appreciate this situation are in a position to meet the needs of the present or future. One motor truck judiciously placed will prove the means of selling perhaps 50 others, while insufficient attention to the individual needs and demands of the particular purchaser may result not only in the loss of subsequent sales but in materially retarding the development of the industry.

It is of particular significance that many manufacturers and agents are beginning to appreciate the truth of this argument. At a recent meeting of the Motor Truck Club in New York, an organization which has done much to foster a better understanding of this situation, the principal speaker dwelt at some length upon the type of salesmanship required. He made a special plea for the recognition of the practical needs of the individual case.

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RUPPERT'S BREWERY ELECTRIC DELIVERY.

After Eight Years Practical Experience 41 General Vehicle Wagons Are Added to the Seven Trucks in Comparative Service with Animals and 35 More Are Ordered—System of Accounting for Work and Maintenance a Model.

By William W. Scott.

ECONOMY is the one subject that commands the attention of all men of affairs. The application of the term may be with reference to innumerable conditions. It may be applied to every industrial or commercial enterprise, great or small, with precisely the result the attention given deserves. That is to say, that economy is obtained proportionately to the judgment and the desire of those who are the executives of the business concerned.

Economy in its best sense is not so often realized,—completely realized,—by the small concern as by the large, because it is very generally believed that to discard what is in use, and to a certain extent serviceable, is not economy. Perhaps another way to put it would be to say that only a man of considerable resources and confidence in his own judgment would incur a large expense and entirely change a department and its service, when what he had was at least the equal of his business competitors, and reasonably productive.

In every aspect of industrial and commercial activity, however, economy is not to be judged by the business of another. No man is justified in continuing a method when a saving can be made by a change, and it is quite as desirable to economize in one department as another. Practically every business man can appreciate economy, however applied, but where one has accepted a condition and does not realize its extravagance or the possibilities for saving, it is often difficult to convince one that this particular subject should receive the attention its importance deserves.

Every large enterprise is conducted according to system, which means an accounting that determines every form of expense and revenue. Such systems develop possibilities for economies, and this is particularly true with regard to industrial or commercial enterprises dealing with any form of transportation. It is essential that highway haulage be employed, especially if there be a considerable volume of local or community distribution. For this service the motor wagon is available. Its value depends largely upon the character of the freight carried and the method of use.

It may be assumed that where the work is now done by horses it is necessary to continue the system the vogue, and that the only manner of saving is by carrying larger loads and carrying them faster, reducing the number of transports and the number of men employed. This may appear to be the logical development of the use of the motor vehicle. As a matter of fact these conclusions are not only not well founded, but the economy is brought about in an entirely different manner. Of course there is the accounting system, which determines the expense, but this must be created on practical lines, for simplicity is imperative to produce the best results. The manner of delivery by horses is not the question and should not be considered save to regard the expense of animals as a measure for economy.

There is no question as to the utility and capacity of the motor wagon as contrasted with any other form of transport, but to obtain the largest degree of service the delivery or haulage by these conveyances must be planned without reference to any previous method employed. Obviously to create a service and to follow practise with any



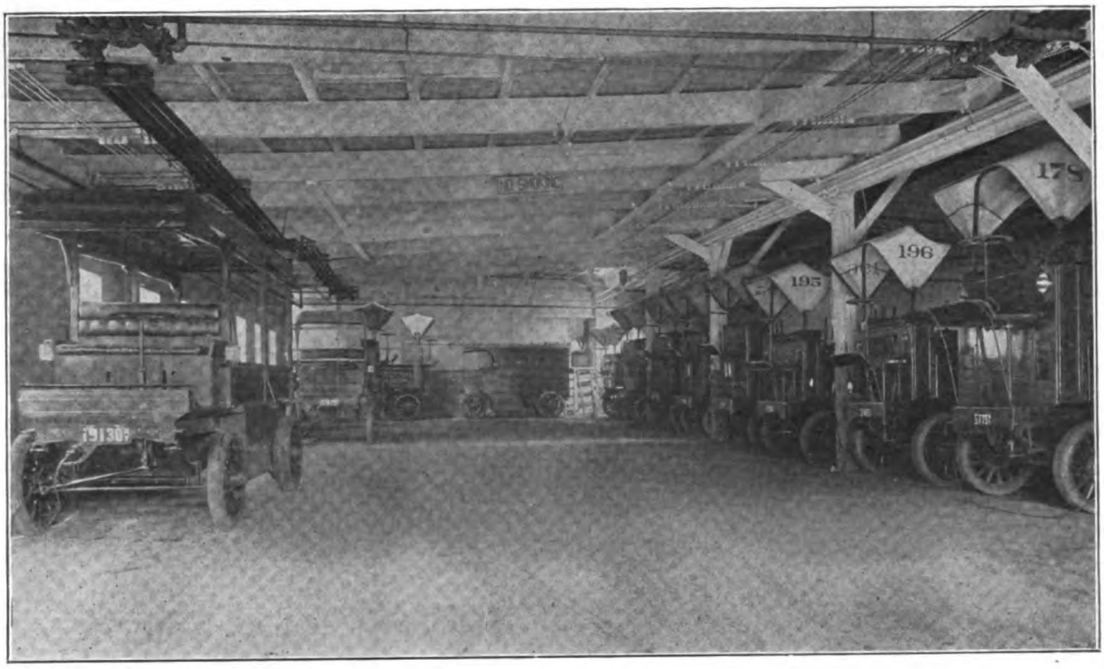
A Section of the Loading Platform at Ruppert's Brewery, Showing the Facilities for Economizing Space and Time of Trucks and Men in Delivery of the Keg Products.

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other type of vehicle is to necessarily limit the results, for the acceptance of any one condition as a restriction is to minimize possibilities.

Without question the greatest successes are made through experiment, but experimentation with business is not favorably regarded by many men. Then what is desired are practical examples that can be understood, in which the one method can be shown as against the other, preferably under the same supervision and management. The longer these have been employed the more dependable the conclusions and the more positive the results.

One of the most striking illustrations of the utility and economy of the motor truck is to be found in the delivery of Jacob Ruppert's Brewery, which is one of the largest industries of this character in New York. The haulage is by two methods, animals and mechanical wagons, the former having been the vogue since the establishment of the brewery, the latter having been begun in 1903. The animal service was continued with increase of horses and horse wagons until the beginning of 1911, and since that time the motor vehicles have been increased rapidly and the horses have decreased, although there are now nearly



A Portion of the Old Cooperage at Ruppert's Brewery Utilized as an Electric Truck Garage—Now Filled to Its Capacity, a Model Station Is to Replace It This Summer.

200 being utilized in the delivery at this brewery.

There is little doubt, however, that these will be disposed of long before their usefulness has been fully realized. As it now is planned these will be used so long as the period of transition continues, and it would not be at all surprising if within a year practically all of the horses were retired and the delivery made by motor vehicle. There is no question that this result will follow and it is merely a matter of time—in fact, largely an element of convenience—before the brewery will utilize nothing but motor wagons and trucks. It is not to be assumed that this change is from any other reason than economy. Neither has there been radical change in methods. In truth, there has been adherence to the original manner of distribution with a surprising measure of success. It is within the range of probabilities that the system can and will be materially improved, an end to which the management is making careful study and investigation, but what has already been accomplished has been along the lines of horse transports and general custom and by utilizing the superior radius of movement.

The Ruppert brewery is an immense plant. It is located in Third avenue and 90th, 91st and 92nd streets, and it is on a site that will permit of large expansion. Within two years something like $2,500,000 has been expended for improvements and these have by no means been completed. When the plans made and contemplated are consummated it is expected the stock house capacity will be close to 2,000,000 barrels of beer annually, which tersely indicates the proportions of the industry. The delivery of so large a product is quite as important as producing, and with the economy of but a trifle a barrel it will be understood that the total annually may approximate an enormous sum. It is not too much, in the view of the experience of others, to expect a saving of perhaps 25 per cent. in the cost, and assuming that this will be from eight to 10 cents a barrel, a not improbable figure, the economy is from $160,000 to $200,000 a year, and equal to the income from $4,000,000 invested at four and five per cent., on the basis of stock house capacity.

It is not until the aggregate saving is known and the amount contrasted with the earnings of capital at normal rates of interest, that the possibilities of this one economy are realized. In other words, with the production and the cost of delivery as stated, the change in manner of haulage would be equivalent to an investment of $4,000,000 without the risk or the care that the management of so large a sum would entail. Not only this, there could be no possibility of loss or shrinkage. Viewed from this aspect the economy in haulage becomes a subject that demands an attention at least equal that given any detail of the business, and a degree of supervision that will secure this saving.

If one fact should be impressed upon the business man it is that with so large an enterprise, conducted with the system and care that its proportions should demand, there should be great possibility for economy, especially when it is reasonable to assume that with horse delivery there was equal attention given to detail. Not only this, it is probable that with concerns not as exacting and with less perfected methods of accounting these possibilities are even greater.

Any practical business man would unhesitatingly say that it would be decidedly unwise to reject any opportunity, no matter how small the result, for manufacturing or selling economy. This being so there would be nothing inconsistent in a reduction of the expense for distribution, of which delivery constitutes a large part. It is apparent that until the motor wagon became available the cost of distributing, so far as haulage was concerned, received practically no attention, and the expense was accepted without question.

In dealing with this subject from the viewpoint of commercial economy it is purposed to consider the utility of the electric vehicle in brewery service, for while the Rup-

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pert brewery has a group of gasoline wagons of a half-dozen different makes it has now in its garage 48 General Vehicle machines, with orders placed for 35 more, so that within a comparatively short time there will be 83 G. V. trucks and wagons employed for its local and suburban distribution.

In selecting the electric machine for delivery within the radius of its movement no decision was reached until after experiment extending over a period of years. The first trucks were four in number and were delivered in 1903. These were of the old construction, of the pedestal type, so-called, with two motors instead of one and with the plain wheel bearings. The batteries were heavier and less efficient and the mileage was less than the later vehicles. These were given a character of attention not as productive of efficiency because they were not as well understood, and their maintenance and upkeep was not systematic; that is, as compared with the methods the vogue today. They were regarded as experimental, and so they were.

These machines were placed in precisely the same service as the horses and they were worked hard. They were subjected to every test and were driven by men who had previously driven horses. These men were not experts and knew nothing of the trucks, their knowledge being gained by their daily work. It is natural to assume that their inexperience was more or less expensive. But the trucks endured and they did the work. In 1907, when these trucks had been used for four years, three 3.5-ton trucks were ordered. These machines were used for the delivery of bottled goods and were, with the four older machines, kept at the brewery in convenient shelters and given the attention that the experience with others dictated was wise. These, too, were placed in charge of men who had previously handled horses.



Some of the General Vehicle Electric Trucks, Five Tons Capacity, in the Equipment of the Keg Delivery Department of Ruppert's Brewery, New York City.

The service given by these trucks was more severe than the machines now receive. The three 3.5-ton machines were the first of the present standardized types to be used. These were single motor driven, but with the chain exposed. The pedestal suspension had given way to the semi-elliptic springs, and there were numerous other improvements developed through four years of consistently progressive manufacturing. These seven trucks were given three years' hard service before the results were sufficiently convincing. The records evidenced that the work accomplished was such as to justify a transition of the delivery vehicles, and to substantiate the belief that with systematic care and careful routing of the distribution the electric truck was to be preferred to other forms for the work, within the limitations of the battery charge. Other types of motor wagons were used, for the experience was not confined to electrics.

The examination of the records resulted in a conclusion that it would be desirable to provide a garage, and a cooper shop in the stable yard between 90th and 91st streets was decided to be sufficient for the immediate purposes. The order was given for 41 trucks and wagons, of which 35 were of five tons capacity; four, two tons, and two one ton. Of these, 40 were for delivery service and the other was built as an emergency wagon, being geared to have a speed of 15 miles an hour and a mileage of 45, travelling half of the distance loaded. It was also decided to install dynamos for the purpose of supplying the current to be used, this plant being incorporated with the regular power installation of that section of the brewery near at hand. In the garage was placed a charging board with capacity for giving current to the 48 machines simultaneously. Near this was located the battery room. The garage equipment also included a half-dozen spare batteries. Besides this, a workshop was provided and the garage was equipped for giving other attention.

The garage was opened Feb. 1, 1910, and James B. Scanlon, whose experience had been for years in mechanical and electrical work, and for a long period with electric wagons, was made manager. When the machines ordered were delivered he had 48 vehicles in his care. These, according to capacity and length of service, were as outlined in the detailed tabulation presented below:

Ruppert Electric Truck Equipment.

Year Delivered	Capacities				Total in Service
	One-Ton	Two-Ton	3.5-Ton	Five-Ton	
1903.....	0	0	0	4	4
1907.....	0	0	3	0	3
1911.....	2	4	0	35	41
	2	4	3	39	48

The results with this equipment were so satisfactory that during the present year four two-ton wagons, two 3.5-ton trucks, and 29 five-ton trucks were ordered, and these will be delivered as rapidly as they can be produced by the maker. It is probable that all of these will be in service by the middle of August, and perhaps before. When these have been received the electric delivery vehicle will consist of two one-ton, eight two-ton, five 3.5-ton and 68 five-ton, a total of 83. Of this number, 82 will be in service regularly, and the other will be the emergency wagon.

Considering this installation for a moment it must be understood that even with the five-ton machines the load is not increased as compared with an average brewery de-

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Five-Ton Truck with 50 Half-Barrels, a Normal Freight.



Five-Ton Bottle Truck with Capacity of 180 Crates of 24 Bottles Each.

livery horse team. The freight is from 50 to 52 half-barrels to a load, and the weight is approximately 11,000 pounds, but while this would seem to be more than horseflesh could endure for any extended period, it should be known that the daily mileage for horse teams is seldom more than 12, and generally it will hardly reach this figure. The horses are carefully selected for the work, and are extremely large and powerful. A team will range in value from $1000 to $1500, and some will exceed the last mentioned sum. They, with the wagons and other equipment, will closely approach a cost of $2000.

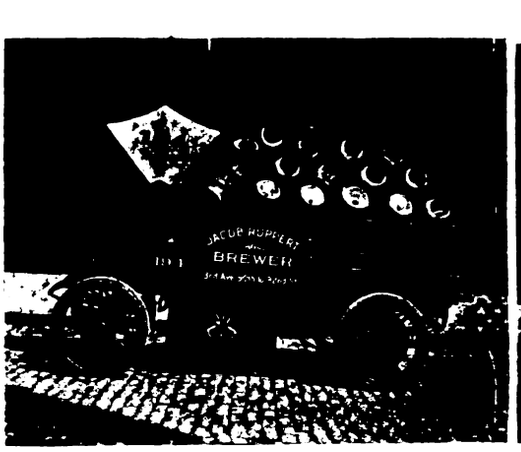
With practically no difference in the load carried by the vehicle there are but two other factors for superiority, the one being the greater speed, and the other the greater distance that can be travelled in a day. The electric truck of five tons capacity has a battery mileage of 35, and a speed of seven miles an hour, and the 3.5-ton truck a battery mileage of 40 and a speed of eight miles an hour, half of the battery mileage with a full load. This will permit carrying the freight practically double the distance that a horse team could be driven consistently, and at about three times the pace at full speed. But under any circumstances the truck of five tons capacity is at least 100 per cent. faster than the horses.

The brewery service is different than almost any other in that there is comparatively little unproductive mileage; that is, in the sense of haulage, for when a freight of 50 half-barrels, for instance, is taken out, a load of from 75 to 90 empty containers is brought back. There are exceptions to this, of course, but reference is made to normal conditions. The Ruppert Brewery service extends in every direction and the delivery is divided, with the gasoline trucks taking the longest hauls, these being into Westchester county, to villages, towns and cities within a distance of say 30 miles. It may be profitable to send products further by motor truck, but unless there is the productive return mileage this has not been satisfactorily demonstrated. The delivery within 20 miles, however, is generally made by the electric machines.

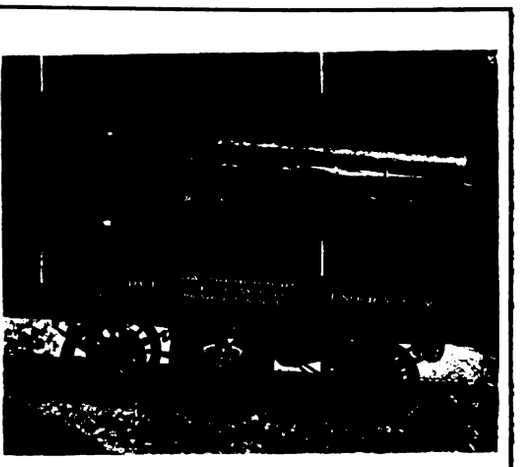
The manner of delivery is systematized with extreme care, the heavy loads being sent away first in the day. The trucks report beginning at 3 each morning, of the working day during the summer period and at 4:30 in the winter. Each driver goes to the garage to find his vehicle in readiness, or one that he is to use that may be temporarily assigned, and he drives it to the loading platform. Each truck loads at a particular place and at a stated time for the first load of the day. A specified time is allowed for loading. The kegs and barrels are brought to the loading platforms by conveyers and packed into the trucks. With the bottle department, the crates of bottles are brought to the loading platform by similar means and loaded. As stated, the full load for a five-ton truck is 50 half-barrels or 180 crates of bottles.

The time allowed for a day's work for the men is eight hours, and this fact necessitates careful consideration of the delivery. This is arranged by the superintendent, the chief of the shipping department, and the manager of the garage, because each executive must co-operate with the other. The routes are made out with several objects in view. The first is the distance to be traversed, the second the number of customers to be served, the third the highway conditions, the fourth the traffic and the different probable causes of delay, the fifth the capacity of the vehicle as to speed, freight carried and battery mileage. The problem is to serve the greatest number with the least travel, the solution of which entails careful study of every factor and probability, so that the assignments will necessitate some of the machines making three trips to and from the brewery to serve a route, while others make two and even one. The order of delivery is made out and the driver is required to follow this. With a reasonable allowance for delays the trip time is established.

Now it must be understood there is a considerable elasticity required in this service and a route that may be easily served during the cold or even moderate temperatures will be beyond service with any form of single vehicle when the heated periods of the year trebles the consumption. Then

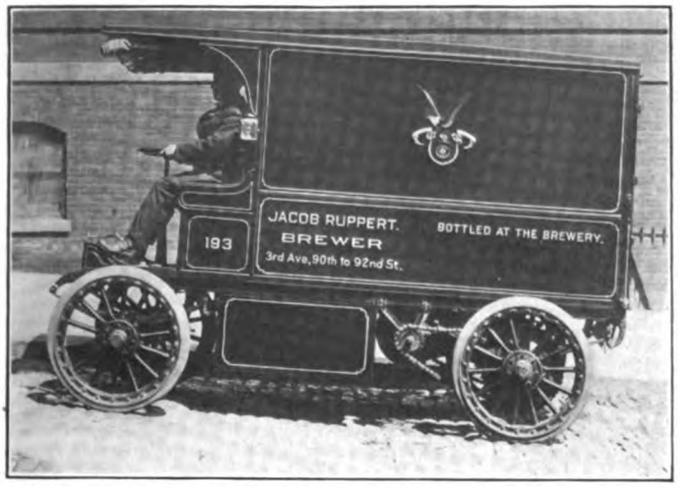


One-Ton Special Delivery Wagon, Keg Department—Speed 10 Miles.



Emergency Wagon, Two Tons Capacity, Speed 15 Miles—Always Ready for Service.

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One of the One-Ton Special Delivery Wagons of the Bottle Department, Utilized for Quick Service.

the routes must be adjusted and the delivery equalized so far as is possible, what was served by one machine being divided and another vehicle or vehicles used. Perhaps the route may be shortened and a second or a third delivery made. Besides these conditions, there are the special orders which must be given equal attention.

During the summer the parks and places of recreation must be served, as well as the regular customers, and these deliveries are dependent upon the weather. This class of patronage is no inconsiderable part of the business and many of these customers are long distances from the brewery. To illustrate, it is 17 miles to Coney Island, where the season is not more than four months of the year. The same applies to numerous places that are not as familiar to people generally, but which are equally desirable as patrons. The distribution is to Long Island, to New Jersey, and Westchester county, as well as the city itself, which is a very large area.

It is the duty of the superintendent to have the products delivered, and the shipping department depends upon the garage manager for the vehicles, no matter what the conditions. It will be seen that it may be necessary at any time to provide for a call considerably in excess of the normal distribution, and this places a responsibility upon the garage manager of having the vehicles required. While each truck or wagon is ready in the morning, the demands reduce the battery capacity, so when a machine is brought into the garage it is tested to ascertain what current is available. While "boosting" is not resorted to unless necessary, it may be that there will be a call for the work that this machine can do without additional charging. If so, it is utilized. But should there be a long distance call a fresh battery is substituted, the one removed placed on charge, and the truck sent away with as great capacity as when it was first started in the morning. It is not uncommon for a truck to be driven from 60 to 70 miles in a day and to be in service as many as 23 hours continuously.

This means that the garage manager must know the exact condition of each battery and of each machine at his disposal and be able to provide the shipping department with a truck or wagon that will do the work required. That there may be no diminution of service and that there will be abundant facilities, it is necessary to maintain each vehicle to the highest standard possible. This can only be done by systematized attention. Whenever a condition is noted that may result in damage or eventual failure, repair or restoration is immediately made. This minimizes the cost of maintenance and the loss of service, and yields the largest degree of useful work. This system insures every desired quality and the greatest economy. The entire value of any motor vehicle is its service, and to lose this greatly increases the cost.

The emergency wagon is a very important equipment. It is maintained with its battery as fully charged as is possible, in readiness for quick service. Should a driver meet with an accident that will disable his vehicle or greatly reduce its capacity he notifies the garage manager. One or two men are dispatched with the "first aid" and this may mean a spare axle, a spare wheel, spare tires, spare armature, spare controller, spare chains, or whatever may be needed in addition to the regular stock carried in the emergency wagon. Of course there are jacks, tackle and tools ready for accident calls. The damaged machine is temporarily repaired, or hauled from a ditch, or towed to a convenient charging station, and started on its route with as little time lost as is possible. If it is necessary to change the load to another machine this is done, but such events are rare indeed.

During the seasons of the year when the work is the hardest for the wagons and the delivery demand is greatest, the garage force is always busiest, because it is necessary to drive the machines much further and care is only possible during the time they are in the garage. Besides, every precaution must be taken against loss of service. Yet so thorough is the work performed that extra Sunday labor is the exception, and not the rule.

The repair department is a decidedly important division of the garage. Here is kept a stock of parts of every type that enters into the construction of the trucks. Nothing that might be needed is lacking, for it is far better to insure against delay than to be delayed, even for a short time, and the machine and tool equipment is such that

JACOB RUPPERT'S BREWERY

CHARGING SHEET

DATE _____ 191 DATE _____ 191

	Veh. No.	ON			OFF			Check	Remarks	Veh. No.	ON			OFF			Check	Remarks
		Time	Amp.	Volts	Time	Amp.	Volts				Time	Amp.	Volts	Time	Amp.	Volts		

Charging Record of the Ruppert Brewery Garage, Arranged for 90 Entries. Form 12 Inches Length and 13 Inches Width, Perforated for Loose Leaf Binding.

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JACOB RUPPERT'S BREWERY
ELECTRIC TRUCK DEPT.
DRIVER'S DAILY MILEAGE REPORT
BOTTLING DEPARTMENT DATE

No. of Vehicle	Miles 1st Trip	Miles 2nd Trip	Miles 3rd Trip	Total Mileage	CONDITION OF VEHICLE AND REMARKS	Time Out	Time In	CHAUFFEUR
10								
11								
12								
161								
162								
163								
164								
165								

Driver's Daily Mileage Report for Ruppert's Brewery, Arranged for 30 Entries, with the Numbers of the Vehicles of Either Bottling or Keg Departments Printed—Form 12 Inches Length and 9.5 Inches Width, Perforated for Loose Leaf Binding.

work can be done at any time that it is necessary. The facilities are sufficient to undertake any repair, restoration or overhaul, and the workers are qualified to carry out any demand made upon them. It is not necessarily a large organization, but it is efficient. The battery is the heart of the electric vehicle and the battery department of the garage is under the supervision of the manager and the best assistants that can be procured. There is no economy in cheap men for work on batteries, and there is need of good judgment in working the batteries to maintain them at the highest efficiency and guard against deterioration. In keeping with the general policy, a stock of battery components is carried and there are facilities for performing any work that may be necessary, so that it is not often that the battery maker is called upon to do work of any kind.

Necessarily a very large part of the responsibility for the success or failure of so large a delivery service falls upon the garage manager. His judgment and resourcefulness have much to do with the results, and the degree of economy obtained. It is he who can utilize every battery to its limitations, give the use of the trucks practically continuously when this is desired, and by intelligent supervision minimize wear and upkeep expense as well as do the work wth the fewest vehicles.

Figures are not available relative to the Ruppert service but the surest indication of the economy of the electric wagon is the order given for 35 this year and the increase of the total to one of the largest, if not the largest, of any one make of machines in use in the metropolis. There would be no investment by a progressive business man if there were a doubt as to the result.

Relative to the system of noting expense it should be stated that the record of the Ruppert brewery is one of the most comprehensive existing in a private garage. When the vehicle is received it is given a number and it is identified by this in all records. As the machine is brought into the garage, to illustrate, the driver reports to the manager's desk and there signs the driver's daily mileage report. These reports are made out for the bottling and the keg departments, the records being kept for each division of the business with the electric trucks. The report is entered against the printed number of the truck and this may account for one, two or three trips, by miles driven, and the total for the day, together with the time of leaving and returning. The driver signs his name and also enters the condition of the vehicle and remarks, the latter indicating any needed attention. This applies to every machine in service. Examination of this report is then made by the manager, who gives instruction to the foreman, the mechanics, or the battery men. As might be assumed the keg department of the brewery is the larger department.

It is necessary for the vehicles to be inspected frequently, and there are two classes of examination. The one is by the foreman, which is made as often as he or the manager may decide is necessary or desirable. Naturally the frequency of such inspections depends largely upon the condition of the machines, and are based on routine or the report of the driver. The routine inspection is with reference to the vehicles generally, and the report examination is, of course, specific. These are thorough and are intended to insure against wear or damage by whatever work may be necessary to make adjustments or restoration. The other examination is designated as general, this being with reference to every part of the machine and to determine its exact condition, both as to chassis and body. The tires are given practically daily attention.

Careful record is made of all the time of the garage employees while working on any vehicle. This applies to the routine work, such as washing, oiling and greasing, and to all mechanical labor, each being kept separately for each

JACOB RUPPERT'S BREWERY
COST OF
TRUCK ..... MONTH

	Foreman Inspection	General Inspection	Body Material and Labor	Battery Labor	Battery Material	Controller Labor and Material	Current	Globes and Lamps	Motor Labor and Material	Painting	Running Gear Material and Labor	TIRES	WIRING	
1														
2														
3														
4														
5														
6														
7														
8														
9														

Cost Record of the Ruppert Brewery Electric Truck Department, on Which Is Noted Every Care and Maintenance Expense The Form Is 12.5 Inches Length and 20.25 Inches Width, Per

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JACOB RUPPERT'S BREWERY

ELECTRIC TRUCK DEPT.

INSPECTORS REPORT

No. of Vehicle	KEG DEPARTMENT	CONDITION	DATE
170			
171			
172			
173			
174			
175			
176			
177			

Inspector's Report, Ruppert Brewery Garage, Arranged for 30 Entries, with the Numbers of the Vehicles of Either Bottling or Keg Departments Printed—Form 12 Inches Length and 8.5 Inches Width, Perforated for Loose Leaf Binding.

machine. Besides this all material used is accounted for, whether it be for the body, battery, controller, motor, running gear, wiring, painting, lamps and globes, and for special work as well. The material is requisitioned from the stock room by order of the foreman or manager, and the charges for these requisitions made against each machine. The labor is charged from the time cards as approved by the foreman or manager. Current is charged at a given cost. If car fare be necessary this is included in the record, together with miscellaneous expenses, and also a determined figure for the bookkeeping expense, this being a fixed amount under ordinary conditions. If a vehicle is out of service this fact is also recorded, with the cause for withdrawal, and when it is placed in commission a similar record is made. Each day the total cost and the total mileage is entered, and the cost for each mile driven. With this is any comment that may be desired.

From this it will be seen that nothing is neglected that will afford specific detail as to any phase of attention, maintenance and work performed, not for any given period but for each day. This record is made on a large blank that will allow entries for each day of the month and, being separable into halves and bindable in loose leaf binders, it is possible to have volumes of reports for months for each division of the delivery, or separate records for each machine by years, as may be desired. The detail cards and requisitions, expense vouchers, and the like, are also separately filed, but the "cost sheet," which has been described, summarizes every fact.

This cost record merely applies to the matter of operation and maintenance and the statement as to mileage expense does not include the fixed or overhead expense. This overhead includes the interest on the capital invested, the depreciation or deterioration through usage, fire and liability insurance, garaging or storage, lighting, heating, water, telephone service, taxes and other similar charges. The manner of computing the fixed expense and the items entering into it are facts not material. The combination of the totals of the overhead and the garage charges or expense will show the aggregate cost of the delivery, and this apportioned by delivery unit will indicate the average a unit or package, which is either barrel or crate of bottles.

It is possible, however, from the daily cost and the monthly and yearly averages, to compare the service of each vehicle for a given period, ascertain difference in maintenance expense, learn causes for actual expenditure as compared with theoretical figures, trace reasons for inefficiencies of machines or service, and apply such remedies as are necessary to establish or restore a standard.

The current is produced by the brewery power plant and the cost is decidedly less than were it supplied by a lighting or power enterprise, which is also an economy favorable to a large installation.

About 200 horses are now in the service of the Ruppert brewery. As the trucks are delivered it is expected that they will be sufficient to keep pace with the demands upon the delivery or shipping department, but the animals will be available for work within their limitations. When the writer visited the plant many of the horses were idle, although all of the trucks and wagons were in use, and two men were busy exercising the teams. There was no better evidence of the inelasticity of the animal service and the reserve capacity of the electric vehicle, for the former means a constant expense when not worked, and the latter will cost but a trifle when withdrawn, and will deteriorate so little that depreciation may be said to be negligible. The original four trucks installed are in use every day and, with the attention now given, appear to be more serviceable than when new. They are now in their ninth year of serv-

ELECTRIC TRUCK DEPARTMENT

YEAR 191

	Washing	Car Fare	Bookeeping	Miscellaneous	Days in Service	Days out of Service	CAUSE	Total Cost		Total Mileage	Cost Per Mile		REMARKS

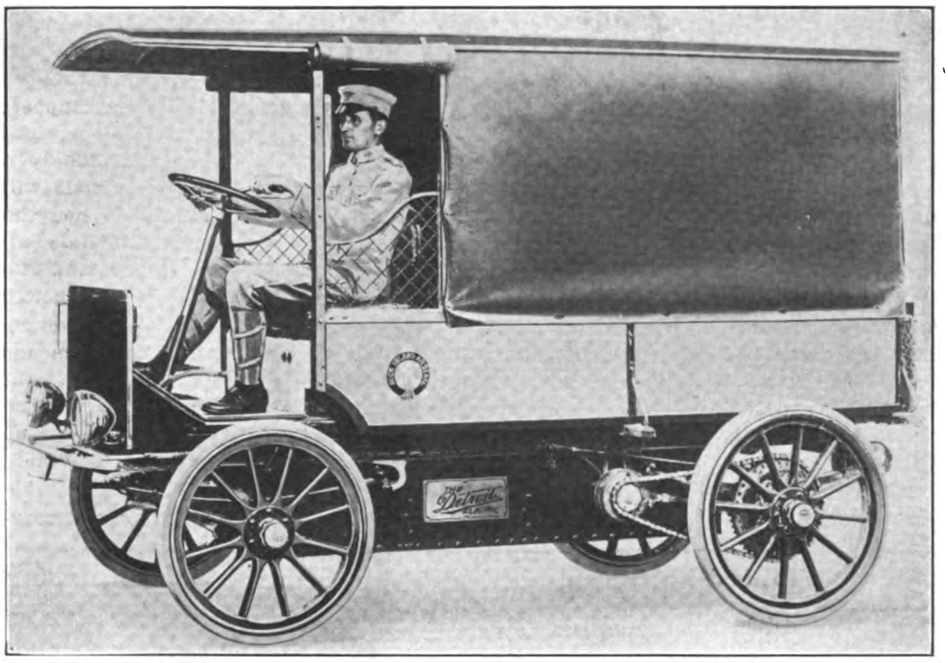
and the Service Given by Each Vehicle by Day, and Kept in Loose Leaf Binders, One Sheet Constituting a Month's Report—forated for Separation and Binding, and Printed on Both Sides.

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ice and may be regarded as having practically demonstrated results that may be reasonably anticipated with the vehicles of more recent construction. But considering the advances in the designs, construction, materials, and manner of supervision and maintenance, there is abundant reason to expect even more extended use.

The Ruppert brewery will build a splendid garage this summer for the electric machines. This may be of several stories, on the site of one of the several horse stables, or it may have a single floor and extend from 91st to 92nd streets, with sufficient area to shelter practically 150 machines. Whatever the form the structure will have it will be as complete and as well equipped as ample resources can provide and skilled engineering and practical knowledge would dictate. If of multiple-story type it will be possible to increase its height to yield additional capacity.

With the new trucks and the new garage the need of the present stables, or at least a part of them, will have become so diminished that the ground on which they stand can be utilized for other purposes. This real estate is constantly increasing in value and business judgment would impel its being used to a profit, either by the further expansion of the brewery plant or for other purposes.



Detroit Electric Wagon in Service with United States Army at Rock Island Arsenal.

From either point of view its value may be utilized and the actual cost of ground rental greatly reduced. It is not practical to estimate in dollars an approximation of the economy by the elimination of the stables and the utilization of the electric truck. That there is a large saving, however, cannot be questioned.

CONSERVING WASTE CURRENT.

The Electric Storage Battery & Manufacturing Company, Cincinnati, O., produces the Hydrox electrolytic hydrogen-oxygen gas generator, which is designed to utilize the electrical units that would otherwise be lost in heating rheostats when charging storage batteries, in the generation of hydrogen gas. Hydrogen gas is employed for welding the joints of lead batteries (this process being known as lead burning) and is often generated from zinc and acid. The Hydrox generator is connected in series with the rheostat and the car on charge, and the current passing through its solution decomposes the water into hydrogen at one outlet and oxygen at the other. The gases are pumped into separate receptacles. Hydrogen and compressed air may be used, oxygen and compressed air, or hydrogen and oxygen. The oxygen may be used with acetylene for metal welding. Each standard unit will absorb 40 amperes or less, whatever the rheostat may be set to, with a resistance of one-third ohm. As many as desired may be used. When storage tank is filled the generation may be automatically cut off or an indicating lamp lighted.

DETROIT WAGON IN ARMY SERVICE.

The Detroit electric wagon of 2000 pounds capacity that has been in the service of the War Department of the United States government at the arsenal at Rock Island, Ill., has completed a year's service, and the report covering that period indicates that the vehicle has been exceedingly satisfactory. In the statement made concerning it no comparison is made as to cost of operation, nor is comparison made with the work of animal wagons, but it is regarded as possessing qualities that will in every way meet requirements.

The Rock Island arsenal is located approximately in the centre of the section under the jurisdiction of the Department of the Mississippi, from which distribution is made of supplies for the different garrisons and posts. Officially at Rock Island the service extends across the Mississippi river to the city of Davenport, Ia. The portion of a report relating to the service of the wagon, states:

"During the year which the car has been in service it has been on the road every day and has been travelling as high as 65 miles on one charge. No trouble whatever has been experienced in getting through the snow. Every day we make regular trips to the postoffice with mail and also break the roads when the snow is sometimes, three, four or five feet deep in places. We have not missed a single trip during the entire year with the exception of one day when the car was sent to the garage for inspection. For the general hauling work required at the arsenal, we find our Detroit Electric to have plenty of speed, ample mileage capacity and power."

The vehicle is equipped with a 60-cell A-6 Edison battand is made by the Anderson Electric Car Company, Detroit.

FREE MONTHLY INSPECTION.

The Boston Edison company has announced to all the users of electric vehicles in Boston and vicinity that it has arranged for free inspection of machines at its Atlantic avenue garage and owners are invited to avail themselves of the service, the purpose being to bring about greater efficiency and reliability by the application of the practical knowledge and experience of its experts. The inspections will be made monthly, as arranged by the owners at the garage, and record will be kept of all machines and their conditions and results accomplished. It is anticipated that the plan will result in a decided increase in the use of electric vehicles in that city and vicinity.

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COUPLE-GEAR ELECTRIC FIRE APPARATUS.

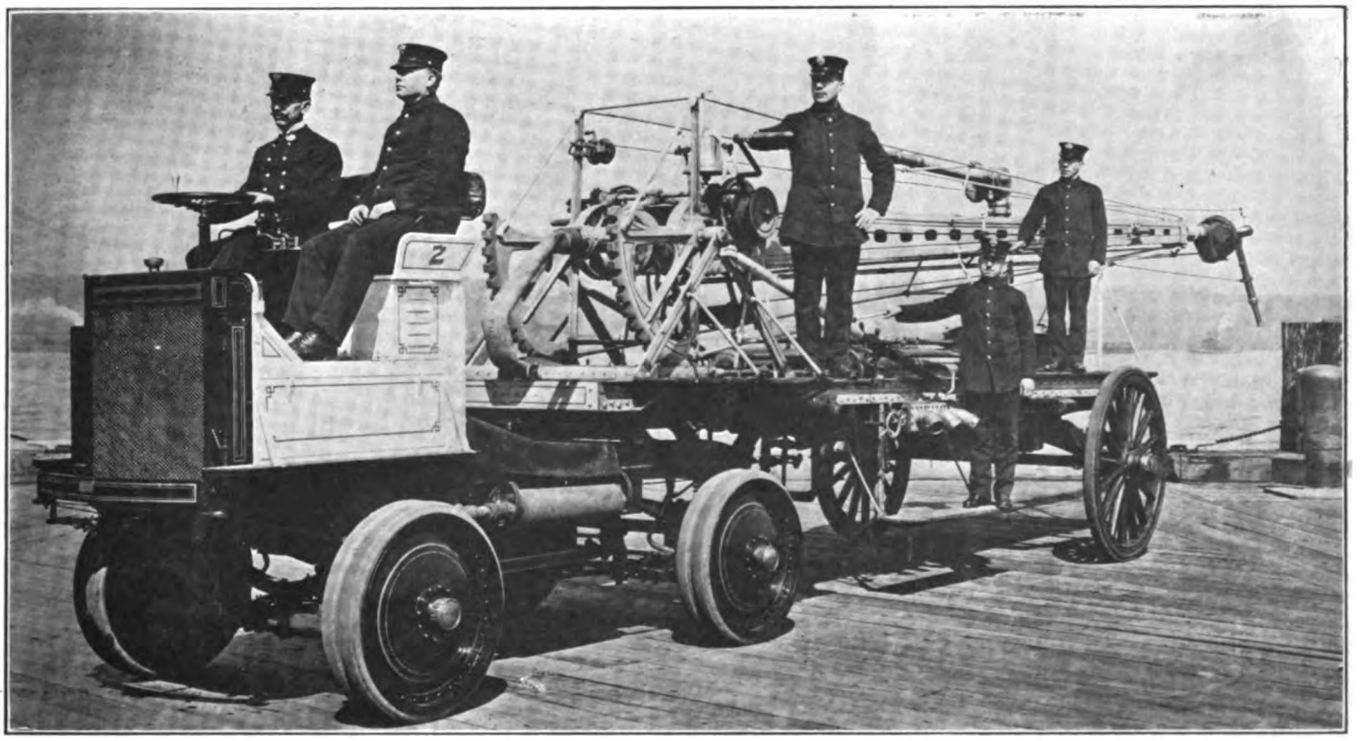
IN THE extremely exacting service of the fire department of New York City, it may be assumed that the test that may be given apparatus is such that, if it shall be approved, it will meet the requirements of any other municipality in this or any other country. The fire risk in New York is believed to be as great as in any other city in the world, largely because of the character of the buildings and the towering heights to which they are erected, and for that reason the equipment desired is the best that experience and complete knowledge of conditions can dictate.

For a year and a half an electric driven apparatus has been tested in a section of the city where its calls have been decidedly numerous, and the results were so satisfactory that two other similar apparatus have been added to the department, while a test is now making of a fourth, which is the only electrically driven steam fire engine in America, so far as is known.

willingness to utilize equipment that may be regarded from the New York viewpoint as more or less experimental. The reason for this comment is to make clear that there is a conservatism in the use of power driven apparatus that may appear to those who are not informed of the policy to mean practically rejection of this form of equipment.

It will also be understood that this policy means that whatever may be employed by the department is subjected to tests of endurance that might appear to be unnecessary, and that such trials are prolonged beyond what might seem to be a satisfactory demonstration. However progressive New York may be otherwise, the fact that the apparatus of its fire department is practically all animal drawn indicates that when safety of property is the stake nothing is taken for granted.

The installation of the first apparatus by the Couple-Gear Company of New York was a concession that was based



Water Tower No. 2 of the New York Fire Department, the Second of Three Apparatus Converted from Horse Draft to Use with Couple-Gear Gasoline-Electric Tractor—Estimated Cost of Fuel and Oil for First Year's Service Is $18.

It can be said that the present policy of the men who control the fire protection of New York is to avoid experimentation, that is, so far as to do so would, in their opinion, develop a possible weakness in the service. It is believed that whatever equipment is utilized it must be, so far as human mind can forecast possibilities, beyond failure. That is to say, that no matter what the emergency or the conditions the apparatus available must be instantly ready for any demand that may be made upon it. Such emergency might not eventuate in a score of years, but the service must be prepared. For this reason there is no disposition to take chances. That is, whatever is absolutely established as dependable will be used until experience has proven that whatever improvement has been made is equally reliable.

What has been stated can be applied specifically to the borough of Manhattan, to a considerable portion of Brooklyn, and perhaps to a portion of the borough of the Bronx, but in the sections of the city given over to detached residences, to what might be considered the suburbs, there is a

on substantial evidence of the reliability of the tractor. The addition of the other three, after nearly a year and a half service, is regarded as recognition of qualities that justify more extended trial and test. To have four different equipments, of two types, in New York service would appear to be a belief in this character of apparatus.

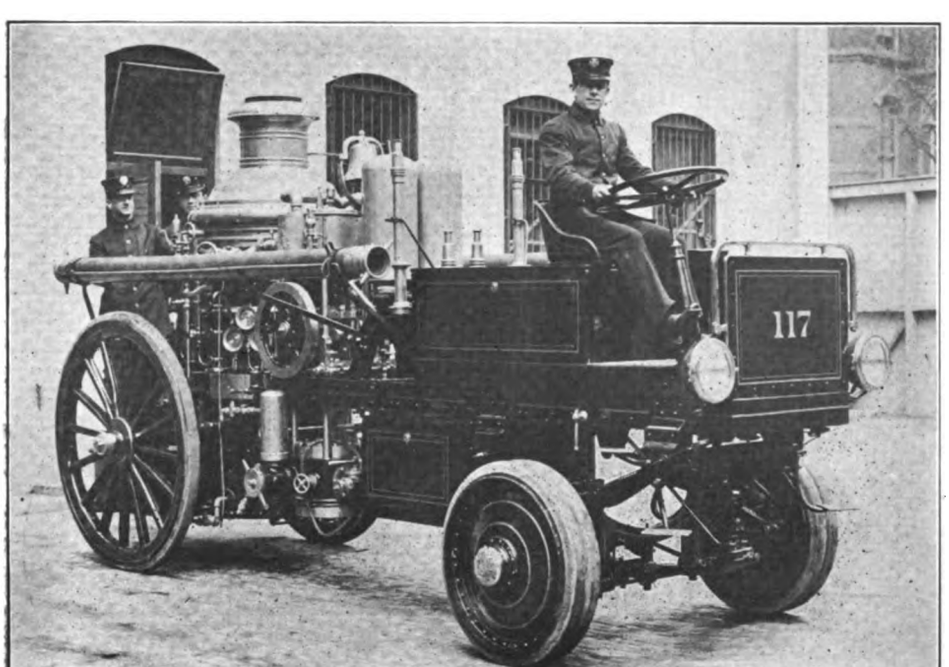
It may be said in connection with this statement that there are limitations to the size of the apparatus that is considered best adapted for all-round work in the business and manufacturing sections, and that there is no belief obtaining that with skyscrapers and mammoth structures equipment of largely increased capacity is required. Another way of putting it would be to say that were material changes to be made, these would be with a view of securing greater mobility and eliminating what might be causes for delay under adverse weather conditions. Economy is not the principal purpose of the department executives. This is commendable, but reliability and dependability are the objects to be obtained.

Water towers as used in New York are about 45 feet in

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length, being approximately that of a ladder truck, and weigh about 14,000 pounds ready for service. The tower or standpipe is collapsible so that when lowered it may be drawn about and housed readily, but when elevated it may be extended to a height of 65 feet. It may be directed from the deck of the truck and several lines of hose may be siamesed into it, so that a solid stream may be directed to an elevation of perhaps 100 feet with great force and efficiency. So practical and so useful are they that these towers respond to first alarm fires.

The animal team for such apparatus is three large horses and the speed for the usual range of response is approximately six miles an hour. Besides, driving such equipment through streets often congested with traffic is accompanied by danger to apparatus and to vehicles and occupants of the ways because of the difficulty of control. The streets of New York are not always wide, and to make speed means that ease and certainty of handling is imperative. Fire Commissioner Waldo was the first to make the motor driven apparatus experiment. The No. 1 tower was selected for the trial and this was placed in commission at engine house No. 31, at Lafayette and White streets, where



Engine No. 117 of the New York Fire Apparatus, the First Steam Pump in the Country to Be Driven by Electric Battery, Equipped with Couple-Gear Tractor—Has a Speed of 20 Miles an Hour and Can Make 22 Miles on a Single Charge.

it was in service with two horse drawn steam fire pumps and two horse drawn hose wagons.

The front wheels, poles, and other horse fittings were removed and in the place of these was substituted a Couple-Gear gas-electric semi-tractor of 10 tons capacity, in which the fifth wheel or turntable of the tower was placed in the centre of the tractor platform. The tractor is fitted with a 50 horsepower four-cylinder motor that generates electric current which is supplied to a storage battery carried under the chassis frame, and from this battery it is drawn by four motors fixed to the ends of the axles. The motor armatures revolve and pinions at the ends of the armature shafts mesh with racks within the inner peripheries of the heavy disc wheels, turning the wheels to any predetermined speed, according to the graduations of the controller. The battery is kept charged by the motor and the tractor may be operated as is any electric vehicle, having all the flexibility and ease of control. As might be assumed there is no limit to the mileage of such an apparatus aside from its speed, for it may be driven as long as the engine can be operated, and beyond this to the capacity of the battery or the charge remaining in it. All operations of charging are automatic, the engine being started either at the start or at any time when considered desirable. The tractor is driven and steered by all four wheels and as each wheel is independently driven there is always the same tractive effort by a wheel, no matter what the arc of turning. Besides this the tractor may be turned in a very small circle, the radius being the length of the water tower.

This tower has been used in Manhattan, responding to alarms between Canal street and the battery, and in a year and a half has not been in the repair shop so far as the condition of the tractor itself is concerned, but was out of commission while repairs were made to the tower standpipe, which was burst through freezing at the Equitable building fire. At that time the tractor remained at the fire for three days, the tower being used for flooding the ruins, and the motor was driven during that length of time. The wheels were frozen into ice in the street a foot in thickness, but when chopped partly away the tractor, handled by an experienced driver, broke itself away and climbed out of the holes. It was estimated that the cost of operating the tower, for gasoline and oil only, during the first year, was approximately $18, or about $1.50 a month. The tractor is geared to a higher speed than were it used for other service and can be driven faster than 15 miles an hour. It will make all runs and reach fire with approximately the speed of the lightest horse drawn wagons.

The water tower is practically the heaviest apparatus in use, and the next are the ladder trucks, and the third the steam pumps. The steamers are usually drawn by two horses. In the nature of an experiment the second installation was shortly after the first of April, this year, when engine No. 117 was converted by the removal of the front wheels and all equipment forward of the "gooseneck" and the substitution of a two-wheel tractor with its deck or frame extended backward sufficiently so that on it may be mounted the "gooseneck." Above the deck is the battery and the control, the seat, the steering wheel and the dash, and below it the heavy springs, the wheels, axles, brakes, and connections, and under the deck is a second section of the battery and the tool box. The general appearance of the apparatus is shown by the accompanying illustration.

This is driven by current drawn from the battery and supplied to motors contained in each of the two forward wheels. Each of these motors is three horsepower and will take a momentary overload of 200 per cent. so that for a brief period 18 horsepower may be utilized. The capacity of the battery will be exhausted the more rapidly when high speed is made, but it is estimated that the engine may be driven 22 miles on a single charge, and to 20 miles an hour if this should be necessary.

The electric battery steam fire pump was placed in service at the De Kalb avenue station and is now in use daily. One of the first runs that was made after it was placed in commission was to Coney Island, which is approximately 12 miles, and this is many times what would ordinarily be required in regular use. The claim made for this apparatus

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is that it has far greater speed, can be driven much further, is tireless, is always ready, can be far more easily controlled, and that it is in every way dependable. One of the chief reasons for the trial of this form of tractor is the belief that it would be more easily driven in traffic, and that four wheels is the logical number to use because of the many corners to be turned and the obstructions to be avoided, the shorter apparatus being faster than the long, all other conditions being equal.

The second water tower, known as No. 2, was placed in service April 1, and the first week in May tower No 3, in duplicate of No. 2, was also placed in commission. Tower No. 2 is shown in an accompanying illustration, this being taken just before it was regularly installed. Both of these are, like tower No. 1, hauled by gasoline-electric tractors, and with this equipment have the same relatively wide radius of movement. Official reports as to the work performed by No. 1 tower have not as yet been made, but it is pointed out that the installation of the second and third, as well as the conversion of the steam pump, is evidence to Commissioner Johnson and to Chief Kenlon that the results have thus far been satisfactory.

New York is the first great city to experiment with the tractor in hauling apparatus. The work that this apparatus will accomplish will receive the closest attention of electric vehicle experts and advocates, as well as the more general observation of all fire department executives and attaches.

M & P ELECTRIC DELIVERY WAGON.

The design of the 1000-pound delivery wagon produced by the M & P Electric Vehicle Company, Detroit, differs from the conventional electric chassis in that the motor is carried under the seat of the driver and the power is transmitted by a shaft extending between the battery sections to the jackshaft, and thence by side chains to the rear wheels. With the installation of the body equipment the machine differs but little from the accepted and approved designs.

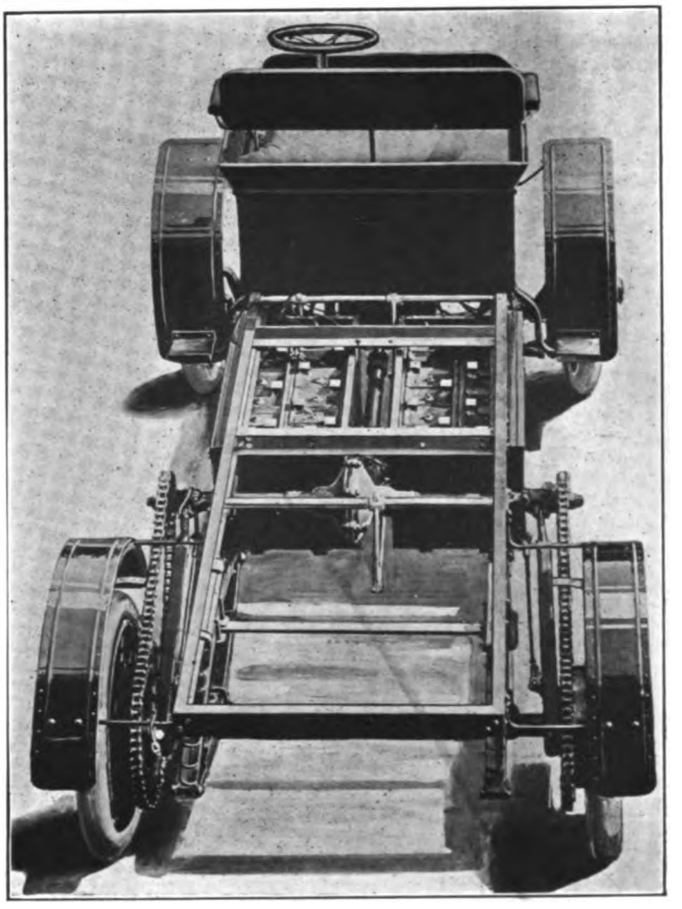
The wheelbase of the wagon is 100 inches, with standard tread, and this gives a loading space of 80 by 42 inches for either open or enclosed body, the latter having a height of 58 inches. There is a liberal seat for the driver and sufficient leg room behind the thin, straight dash.

The chassis is of three-inch steel channel section, hot riveted and strongly braced. This frame is mounted on full elliptic springs 36 by two inches forward and 40 by two inches rear, with nine inches spread, the rear springs being attached to a slide that is bolted to the chassis frame, so that while the spring is maintained in its relation with the chassis it has a forward or backward movement, proportionate to the compression of the spring by the load or road shock, within the radius of the swing of the torsion rods. Without this movement, there would be very severe stress upon the springs, both from road shock and from tractive effort. With it, the spring action is complete and the torsion rods relieve the springs from the driving strain. This construction permits the use of the full elliptic spring, with the accompanying quality of suspension.

The front axle is a drop forged steel I section, 2.5 by 1.5 inches, with 1.625-inch diameter spindles, and the rear axle is forged 1.75 inches square, with spindles 1.75 inches diameter. The tiebar is placed behind the front axle for protection. The wheel bearings are Weston-Mott cup and cone, with balls of large size and adjustable to any desired point. The wheels are wood, artillery type, with 12 spokes 1.75 inches diameter, and are 32 inches diameter, being fitted with 33 by three-inch solid tires, with demountable rims. The wheels and equipment are to the standard adopted by the Society of Automobile Engineers.

The motor is the Westinghouse type V-50, strap wound, 80 volts, 30 amperes, with a maximum of 1500 revolutions a minute, and guaranteed to have 85 per cent. efficiency. It is suspended from the middle of the frame beneath the seat of the driver. The power is transmitted through a shaft having two universal joints to the jackshaft, located behind the battery box, and then by the usual sprockets and chains to the traction wheels. The total reduction is nine to one and the vehicle's maximum speed is 12 miles. The jackshaft is a Weston-Mott construction with annular ball bearings at the differential and Hyatt roller bearings at the outboard ends.

The battery box is suspended from the centre of the steel chassis frame and is in reality two boxes, each containing two trays and 20 cells of nine plates each of the 40-cell Gould battery, type T H. These batteries are guaranteed by the maker in cities in which there are representatives, to maintain a capacity on discharge for 4.5 hours. The catalogue rating is 5.5 hours.



Chassis of M & P 1000-Pound Delivery Wagon.

The controller is the Westinghouse continuous torque type and the steering gear is a worm and sector with a 15-inch hand wheel. The service brake shoes expand within 14-inch drums on the rear wheels, and the emergency brake shoe expands in a 10-inch drum on the jackshaft, both being operated by pedals. All brakes shoes are two inches width. The lamps are inset in the dash and are protected from ordinary dangers of breakage. They have means for adjusting the focus.

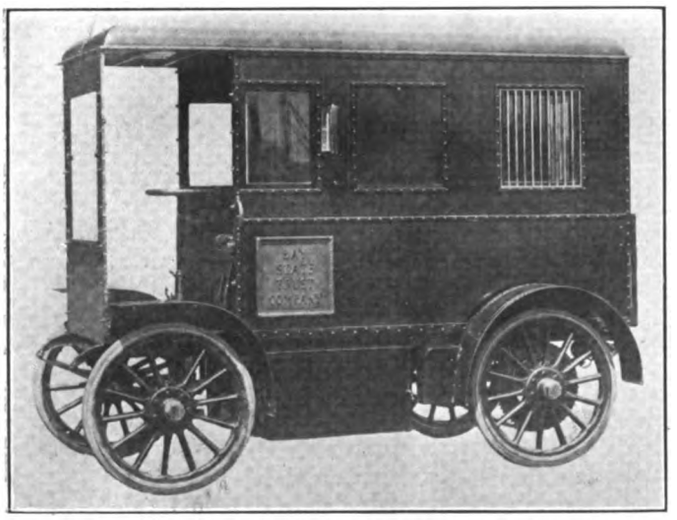
It is maintained by the maker that the cars are constructed of standard products by makers of the highest repute, which is a guarantee of high quality of material and workmanship, and a certain insurance that the cost of maintenance will be relatively small.

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G. V. BANK DELIVERY WAGON.

Competition has impelled the banks and trust companies of the large cities to give attention to large customers which often entails the transfer of large sums of money, such as delivery of pay rolls, the daily collection of the receipts of stores and business houses, the transfer of securities, and the like, which could not be done by messenger without some probability of loss through carelessness or theft. Not only this, in the daily collections, with the banks closing at a stated hour and the desire to deposit as late as possible, it is desirable to have a service that will be expeditious and absolutely dependable.

An example of the utility of the electric vehicle is shown by the accompanying illustration, this being a 1000-pound General Vehicle delivery wagon chassis, made by the General Vehicle Company, Long Island City, N. Y., and used by the Bay State Trust Company of Boston, on which is a steel body, that is designed especially for this particular service. The wagon is driven about with one or more clerks in the body in charge of the money or securities, and the transfer is made with absolute certainty against loss. The body will resist attempts to enter it without special tools for a considerable length of time, and it would afford protection against any attempt at robbery. This machine is in daily use and has given admirable satisfaction.



Novel Bank Wagon on G. V. Chassis.

PHILADELPHIA STORAGE BATTERIES.

The Philadelphia Storage Battery Company, Philadelphia, Penn., specializes the Philadelphia "thin plate" batteries, this construction being possible with the "diamond grid" plate, which is claimed to insure unusually long life and highly dependable service. The "thin plate" development by this company may best be summarized by the statement made by it that in the period from 1906 to 1912, approximately six years, the weight of a battery of stated capacity has been reduced from 35 to 32 pounds a cell unit, or about 10 per cent., and the kilowatt-hours capacity has been increased from 280 to 400, the intermediate steps being 335 and 375 kilowatt-hours. The number of plates has been increased from 11 to 13, 15 and 17, respectively.

Contrasted with thick plate batteries, which are claimed to yield from eight to nine watt-hours a pound, the Philadelphia thin plate will yield from 14 to 15 watt-hours a pound, which as the mileage of a car is proportional to watt-hour capacity, demonstrates the efficiency of the battery by watt-hours. Another quality claimed for these batteries is the unusually high jars and the depth beneath the element, so that as the active material is precipitated to the bottom of the jar this precipitate will not sufficiently accumulate to entail cleaning, save at long intervals.

Philadelphia vehicle batteries are made in three types: W for service where great mileage is not essential; W M, with thinner plates and a capacity from 15 to 20 per cent. higher than type W, and W T, which is claimed to give a mileage considerable greater than thicker plate batteries and a capacity of from 35 to 40 per cent. greater than type W, having very high discharge voltage and maintaining speed under all conditions. The plates of type W T are the double, diamond grid, that are guaranteed not to buckle.

Philadelphia portable storage batteries are made in sizes adapted for use in operating small motors, lamps, phonographs, or wherever a fairly high rate of current is required. The plates are the standard type W railroad signal batteries, are made with the standard S plates, of high ampere-hour capacity and with any number of cells. For automobile ignition and lighting the batteries are of the double-grid type, similar to those used for vehicle service, improved to meet the special demands for this work. Three types of light batteries are produced, these being especially suited for automobile and motor boat use, but can be supplied of other voltage or higher ampere-hour capacity.

The batteries are assembled in rubber jars with rubber and treated wood separators, and are fitted with the form of terminals, straps, etc., best suited for the purpose for which they are to be used. Where the batteries are in cases they are sealed with acid proof compound, and the hardwood cases have strap handles for carrying.

The company makes broad claims for its batteries as to design, material, construction, service and endurance, maintaining that these will be amply demonstrated under all conditions with intelligent use.

SECOND ANNUAL VEHICLE PARADE.

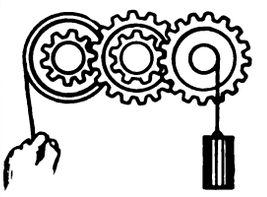
The second annual parade of electric service wagons took place in Boston, Memorial Day under the auspices of the Electric Vehicle Club of that city and the management of Day Baker, New England representative for the General Vehicle Company. The route was from Brookline avenue in Back Bay to the centre of the city and through the principal streets, the line of 150 machines being led by Miss Virginia E. Aiken, New England agent for the Babcock pleasure cars. The number was practically double that in the first parade, a year ago. Many of the machines were loaded and the parade was incidental to the work of the day. All makes and sizes of vehicles were in line and came in for decided attention from many thousands of spectators. Practically every electric vehicle agent or dealer in Boston and vicinity was active in the preparations for the arrangements and the conduct of the parade.

BOSTON ELECTRIC VEHICLE CLUB.

The Electric Vehicle Club of Boston, organized April 3, 1911, which has conducted an unusually active campaign since that time for the promotion of the use of the electric service wagon, ended its activities for the present season with a dinner at the New England Kennel Club at Braintree, Mass., June 5. The members of the club have held weekly meetings since last September, at which addresses have been made by prominent authorities on haulage, and especially electric transport service, and the organization has systematically and consistently brought to the attention of the business men of New England the value of the electric machine for general transportation.

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RECENT MOTOR VEHICLE PATENTS



Brown Electric Gas Lighter.

An electric device for igniting the acetylene at the burners of motor car headlights, which differs from those of ordinary construction inasmuch as it is adjustable, has been patented by Stewart Brown, Chicago. The resistance coil is incorporated in the base of the igniter which is equipped with a band for attaching to the burner. The securing member is insulated and carries a thumb screw and nut for locking the device in the desired position.

Hoffman Chain Housing.

To secure efficiency from chains these members should be kept clean and foreign elements such as dust and mud, excluded. Arnold P. Hoffman, William E. Hoffman and Elmer F. Altman, Minneapolis, Minn., have been granted a patent for a sprocket chain housing which is constructed in two parts and of which is claimed easy disassembling and reassembling. One section of the device is tubular in form and has a bell shaped mouth which permits flexible and telescopic movements between both sections of the device. The larger portion is constructed in sections, these having flanges for securing the parts, and packing is also provided to make the device oil tight.

Hall Grease Cup.

James B. Hall, Cleveland, O., has been granted a patent for a grease cup utilizing solid lubricants. The interior of the device has a number of wires secured together for a portion of their length to form a supporting stem and having their untwisted ends free and extending divergently from the upper portion of the stem to conform to the outline of the cup and for the purpose of supporting the lubricant.

Beam Radiator.

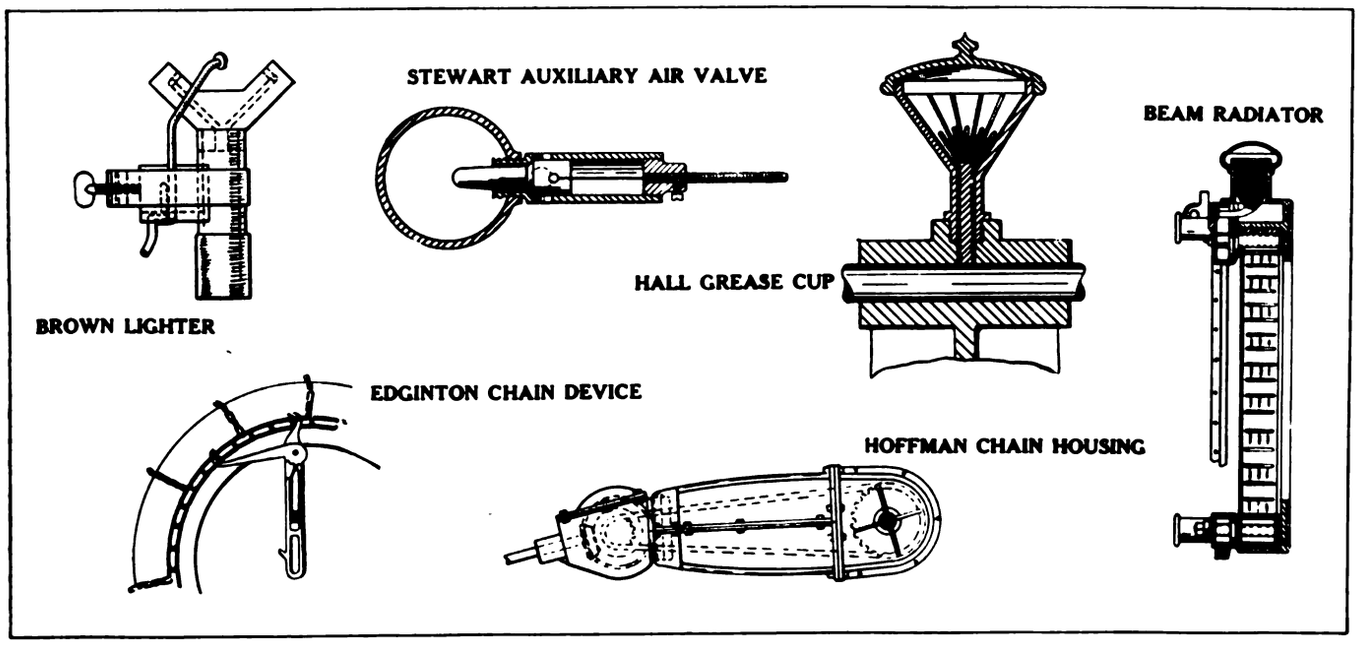
Accessibility and ease of repair in the event of accident to the radiator are of value in the service of the commercial vehicle and Jacob B. Beam, Punxsutawney, Penn., has patented a cooler of this nature. It consists of a series of independently removable sections comprising upper headers communicating with the upper water leg and bearing against the bottom of said chamber and against the upper part of the front frame of the radiator, and lower headers resting on the bottom of the cooler frame. Vertical tubes connect the upper and lower headers and the lower water leg is detachable.

Stewart Auxiliary Valve.

An auxiliary air valve designed for attachment to the intake pipe or manifold of the internal combustion motor has been patented by Alfred C. Stewart, Los Angeles, Cal. It consists of a cylindrical casing, one end of which is reduced and threaded to fit the manifold. This end of the device has a shoulder forming a seat for a movable valve similar to a poppet valve. Attached to the valve is an operating wire enclosed in a flexible housing which leads to any convenient point for service. Air is drawn in through apertures near the valve when the latter is moved from its seat.

Edgington Chain Tool.

William F. Edgington, Springfield, O., has been granted a patent for a tire chain tool which presents practical features, inasmuch as with the device chains difficult of attachment may be stretched taut, facilitating adjustment and locking. The tool comprises two levers, one of which is pivotally mounted and equipped with a pawl which engages with the smaller member. Both sections are fitted with hooks, these being designed to fit and engage between the links of the outside chain. When the lever is moved the action brings the hook members together.

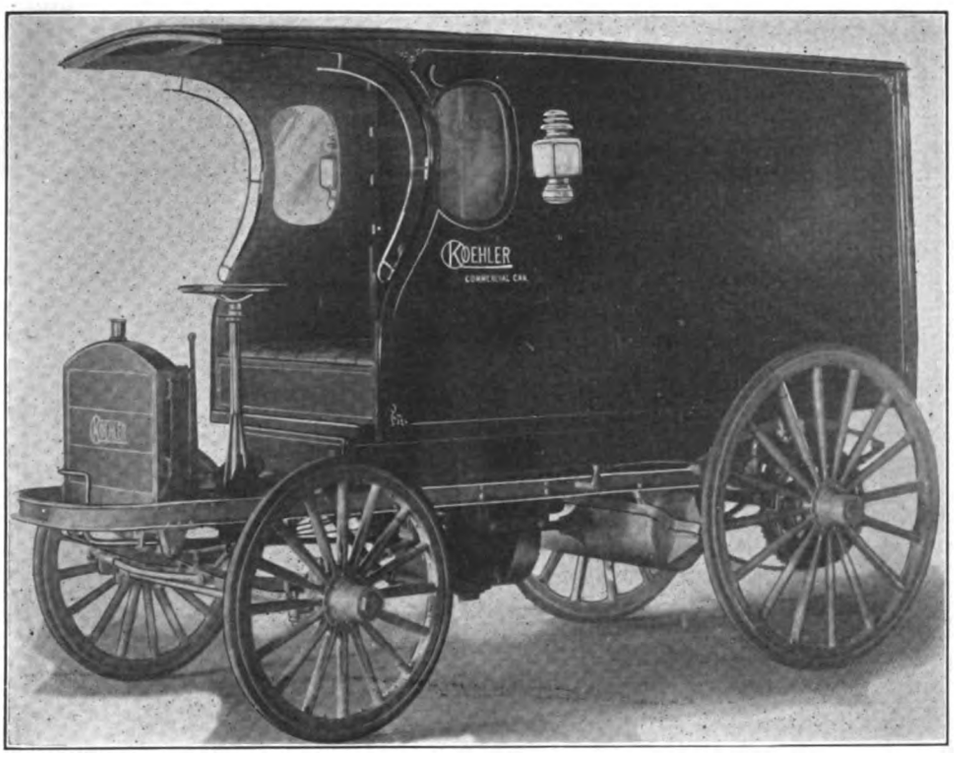


Outlining the Efforts of Inventors Along Lines of Interest to the Manufacturer, Agent and Owner of Commercial Vehicles.

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KOEHLER CAR PRESENTS MANY NOVEL FEATURES.

DESIGNED by one of the pioneers of the commercial car industry, a thorough student of the transportation problem, whose experience has been wholly with industrial transports, the Koehler commercial car, being marketed by the H. J. Koehler Sporting Goods Company, 1709 Broadway, New York City, presents many interesting features. It is the creation of L. E. Schlotterback, one of the best known designers of mechanical transports, who conducted a series of experiments extending over a period of several years to determine the proper carrying capacity for a vehicle which would transport loads economically and still be within the reach of various industries, such as the grocer, expressman, department store, etc. Tests were made with various types of motor cars with carrying capacities ranging from 500 pounds to 10 tons and after a careful study of the problem Mr. Schlotterback decided that the 1600-pound vehicle was best adapted for economical transportation of a load, regardless of business demands.



Panel Delivery Type of Body, Providing Ample Room and Height Back of Driver's Seat. High Grade Finish and Upholstering Are Features of this Newark Product.

Although the Koehler commercial car is low priced the best of material and workmanship is incorporated throughout and this is made possible through Mr. Schlotterback's manufacturing experience, production in large quantity and the utilization of modern machinery. The plant of the L. E. Schlotterback Manufacturing Company at Newark, N. J., is unusually well equipped for the production of these vehicles the entire output of which will be distributed by the Koehler company. Mr. Koehler is well known as one of the largest distributors of pleasure cars and his experience is such in the automobile industry that he is familiar with requirements of body design and in addition to a large variety of standard types such as open flare board, canvas top, full panel, etc., the chassis of the Koehler will be fitted with special bodies built to order to meet the individual requirements of the purchaser.

Simplicity and Accessibility.

A striking feature, aside from its popular price, is the simplicity of construction and accessiblity of components, it being claimed that the most inexperienced can master its operation in a very short time and that the mechanism is proof against improper use. It is also pointed out that its carrying capacity permits of the proper haul at the right price a load, thereby effecting economy, and that its weight makes for low cost of maintenance. Throughout, attention has been paid to small details, which with the use of high grade materials, provide a vehicle adapted for continuous and economical service.

The power plant is ample for the carrying capacity, the motor being of the two-cylinder horizontal opposed type operating on the four-stroke principle, and the bore is 5.25 inches and the stroke four. The rated horsepower is 22-24, although it is stated it will develop considerably more when operating at its maximum efficiency. The crankshaft is 1.875 inches in diameter, constructed of a high grade, heat treated steel, accurately ground to size and the bearings are of liberal dimensions, being 4.5 and 3.5 inches. The crankpins are 1.875 by 2.5 inches. The cylinders are of a high grade, close grained gray iron and these are ground to size, and lapped. The pistons and rings are similarly treated and being carefully fitted insure perfect compression, a factor contributing to high efficiency of the motor.

The connecting rods are constructed of a high grade bronze and their bearings are liberal in size, being of bronze with genuine babbitt linings. The camshaft is of tool steel, with integral cams and these are hardened and ground to accurate size. Both the intake and exhaust valves are mechanically operated and are 2.25 inches in diameter, insuring liberal opening for the passage of the gases. A feature of the valves is their accessibility and ease of adjustment when necessary. The flywheel is bolted to a five-inch flange integral with the crankshaft, an arrangement facilitating the overhaul of the power plant. This is suspended on forged steel hangers from the main frame, a construction making its removal from the car an easy matter. Particular attention has been paid to the balancing of the motor, it operating with a minimum of vibration.

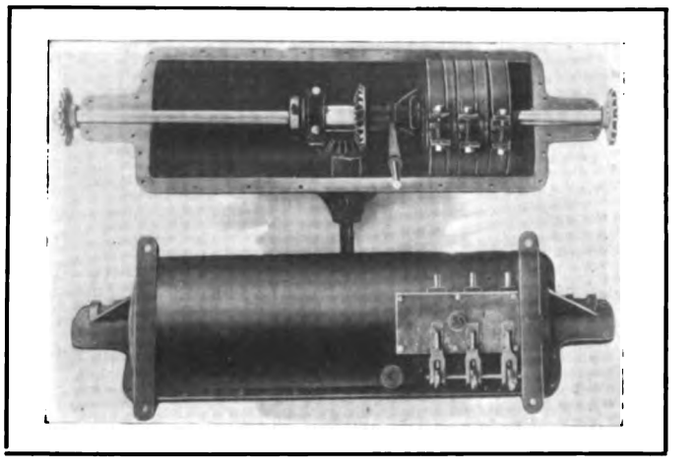
Lubrication and Cooling.

The lubrication system is a combination forced feed and splash. There is a considerable oil reservoir in the base of the crankcase from which the lubricant is drawn by a gear driven pump and circulated through tubes, whence it is delivered in streams into channels in the connecting rods through which it is distributed to the wristpin and crankpin bearings, and to the main bearings. The camshaft bearings, cylinder and piston walls, and the timing gears are lubricated by splash. The oil is filtered as it is drawn from its reservoir.

Cooling is by thermo-syphon circulation through the water jackets of the engine, which are cast integral with the motor and are large to secure efficient cooling under continued operation. The location of the inlet and outlet pipes of the radiator varies from conventional practise as both

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are at the bottom of the cooler, so that the heated water entering the radiator must rise through the coolest of the fluid, quickly reducing the temperature. This arrangement



The Koehler Transmission, Clutch and Differential Are Enclosed in Oil Tight Housing Hung Transversely on Main Frame of Chassis.

provides for circulation so long as there is sufficient water in the radiator to fill the water jackets. The cooler is large and is suspended upon springs to eliminate vibration.

Ignition is by a Bosch high-tension magneto located on top of motor and driven by enclosed gears. A conventional type of float feed carburetor is employed, this being 1.25 inches and the intake pipes are liberal in size and free from bends, insuring easy passage of the mixture to the cylinders. The exhaust pipe is also of liberal area and passes to the muffler in the rear of the car in a straight line, reducing back pressure to a minimum.

Novel Transmission.

A straight line drive is noticeable from motor to a combined transmission and jackshaft, and although there is no angle the shaft is fitted with a universal joint. An innovation is the assembly of the clutch, transmission and jackshaft as a unit, these members being located in an oil tight housing installed transversely in the chassis, as depicted in an accompanying illustration. This housing is divided, and one section carries the jackshaft, differential, clutch and transmission, these members revolving in a bath of lubricant. The transmission is planetary, and all gears are of a high grade chrome nickel steel, hardened throughout. The shafts are a special alloy steel, ground to size, with bearings of phosphor bronze in semi-steel casings. The jackshaft bearings are ample in size, insuring perfect alignment, and operating in the oil tight housing are properly lubricated, reducing wear to a minimum.

The clutch bands for the low and reverse are semi-steel which cannot slip or burn, and the high speed clutch is cone. The shaft to which is attached the bevel pinion or driving gear, rotates in substantial bearings in a housing integral with the transmission casing. As the latter is anchored securely to the frame, it is obvious that perfect alignment is assured. The entire construction of the unit makes for accessibility, as by detaching the chain and retaining members, and disconnecting the universal joint, the entire assembly may be removed quickly and without undue effort.

Double Chain Drive.

The drive is by double side chain to sprockets on the rear wheels. The sprockets are made of a specially selected material, cut carefuly and of large diameter. These are close together, permitting of the use of a short chain, which with the large sprockets allows it to roll freely while the shortness of the chain eliminates stretching.

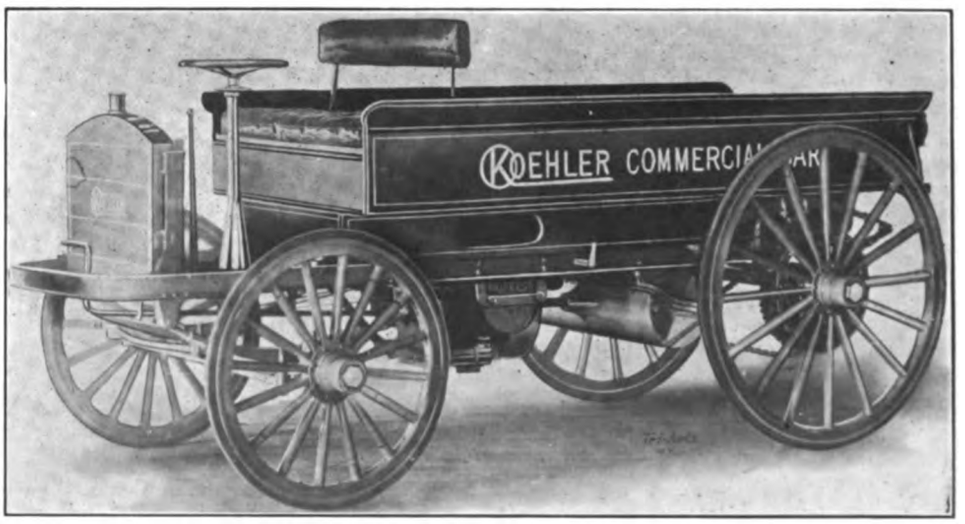
The chassis frame is U shaped, of channel section steel, three by 1.5 inches, with curved end at the front, where it extends considerably beyond the radiator, forming a solid and serviceable protection against damage from contact with an obstruction. The cross supports are substantial and additional strength is secured by the fitting of a metal floor plate of sturdy design, this connecting the frame sides. This floor plate is utilized for securing all controlling parts, eliminating the many braces, bolts and screws used with floor board construction.

Cast integral with this floor plate is the base of the vertical steering column. The steering gear is of the bevel pinion and sector type with 16-inch hand wheel. Throttle and spark levers are mounted below the wheel and are accessible to the operator whose location is at the left with right hand control of the transmission and emergency lever.

Axles and Springs.

The front axle is a one-piece drop forging, 1.5 inches square with knuckle yokes integral. The rear axle is two inches square and both members are constructed of 40 point carbon steel. Special attention has been paid to wheels, these members being large, and both front and rear have 16 spokes of ample size. Two-inch solid motor side wire tires are utilized both front and rear and the designer points out that these dimensions, with the large wheels, are best suited to carry heavy loads with minimum upkeep expense to the user, that they stand up better than additional tire section would on small diameter wheels of ordinary design.

Semi-elliptic springs are utilized in front and full elliptic rear, both being 1.75 inches. The rear members are securely fastened to substantial arms. Two sets of powerful brakes are provided, the service members being on the jackshaft, metal to metal, with 75 square inches of braking surface and at a three-to-one reduction from rear wheels. These are operated by pedal. The emergency members are drums on the rear wheels, metal to metal, and of simple



Open Flare Board Express Body Fitted to Koehler 1000-Pound Car. The Radiator is Protected by a Curved Extension of the Frame.

design. The wheelbase is 85 inches with tread standard. The fuel capacity is 16 gallons and oil, one gallon. Both tanks are located under the driver's seat and are substan-

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tially constructed and very accessible. The speed of the vehicle is from four to 16 miles an hour on the high gear or direct drive.

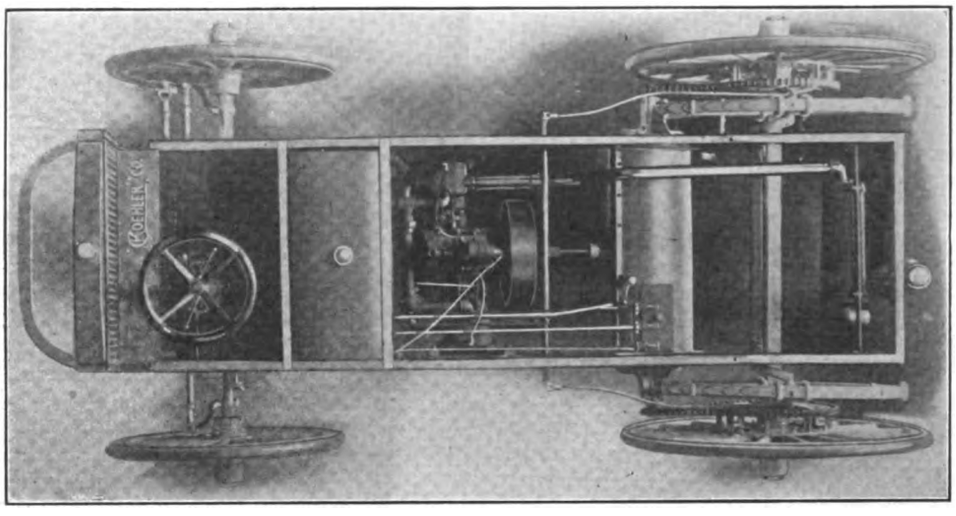
Low Centre of Gravity.

One of the noticeable features is the low centre of gravity for a chassis of this type. This permits of easy loading, and with all body designs the floor is but 36 inches from the ground. The weight is approximately 2000 pounds but varies according to the type of body.

Four standard bodies are supplied, these being an open flare board, express, canvas side and panel. The latter is made in two types, A and B. The open flare board type is large and roomy, the inside measurements being 44 inches wide and 84 long back of driver's seat. The flare boards are 17 inches above the floor. The body is strongly ironed throughout, also to receive a four post canvas top which is listed as extra.

The panel type A is adaptable for a highly finished delivery car and the inside measurements are 62 inches back of the operator's seat and 42 wide. From the bottom of the floor to the roof of the top is 53 inches. Type B is larger providing more space, the inside dimensions being 84 inches back of driver's seat, 42 wide and 53 high.

The vehicles are highly finished and there is a wide variety of colors for selection. The panel A type has a maroon body with French gray gear while the body of type B is black, with gray gear. The canvas side type has the body panel black. The lease line is New York red as is the gear while the under body is finished in ultra-marine blue. The open flare board and express types have the bodies painted ultra-marine blue with gear New York red. Black trimmings are utilized on all types.



Chassis of Koehler Vehicle Depicting Location of Power Plant and Accessibility and Simplicity of Components.

The upholstery is deep and of the best grade leather. The driver's seat is detachable and a "lazy back" is fitted. Throughout the car the designer has made every endeavor to simplify, and special emphasis is laid upon the accessibility of the working parts and ease of operation. Designed to take the place of one and two-horse equipments, and to operate at a low cost, the Koehler commercial vehicle will appeal to those seeking a low-priced machine but embodying mechanical features of a high-priced vehicle.

NEW YORK TESTING TRUCKS.

New York City is experimenting with motor trucks in its street cleaning department for use in the removal of ashes and garbage, Commissioner Edwards having obtained an appropriation of $10,000 to be expended in tests of automobiles. He has rented six, instead of purchasing any machines at present, and they will remain in commission until the close of the fiscal year. Under the old system he estimates that the cost to the city was about 75 cents a ton for the removal of refuse, while under the new, he believes the cost will approximate 23 cents a ton.

CAPE COD PASSENGER SERVICE.

The first automobile sightseeing service to be installed on Cape Cod recently started daily runs from historic Plymouth to Sandwich. A shore route passing through Bourndale has been selected, and the car will take about two hours for its journey of approximately 23 miles. For the first of the season two round trips will be made each day. The car for the service is to seat about 20 passengers, who will be afforded an opportunity to inspect the operations on the line of the new Cape Cod canal.

LOCOMOBILES OPERATE ECONOMICALLY.

In the town of Easton, about six miles from Bridgeport, Conn., work is being pushed forward rapidly on the construction of a mammoth reservoir, which when completed will have a capacity of 4,500,000,000 gallons of water. Playing no small part in this work which is being done by the Bridgeport Hydraulic Company, are two new Locomobile five-ton trucks, built by the Locomobile Company of America, with headquarters at Bridgeport.

The fact that the site was located so far from the centre of the city and the railroad, access to which could only be made over country roads, made the matter of transporting supplies a problem for serious consideration. Horse drawn trucks were used at first, but this proving slow, it was decided to adopt motor trucks, which have now been in service for about two months, hauling cement, coal, machinery and other supplies from the railroad. Very satisfactory results have been obtained, although the conditions have been far from ideal.

In the matter of hauling coal it was shown that one four-horse team was able to make two trips a day to the proposed reservoir with a four-ton load, a total of 48 ton-miles while the trucks easily made four trips with a 5.2-ton load, a total of 132 ton-miles. Charging $3.50 a day for a team of two horses and $2 for the driver, the cost for the four-horse team, exclusive of maintenance, would be $.1879 a ton-mile, while the truck costs, allowing $15 for all charges, would be only $.1137.

G. M. C. SAVES HALF OVER HORSES.

Officials of the Staf-O-Life Feed & Milling Company, New Orleans, La., are firm believers in the advantages of the motor truck, and estimate that a G. M. C. five-ton machine, made by the General Motors Company, Detroit, Mich., saves the firm annually $4200. It is used for carrying goods to the railroad and to city customers, and carries a load of 100 sacks, containing 10,000 pounds. It covers a distance averaging between 40 and 50 miles daily, consuming from seven to eight gallons of gasoline. The manager of the company says that the truck does the work at a cost a little less than 50 per cent. of the drayage by teams.

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FIRE DEPARTMENT NOTES

CHRISTIE TRACTOR IN NEW YORK.

The New York fire department has in service the first front-drive tractor built by the Front-Drive Motor Company, Willow, Clinton and 16th street, Hoboken, N. J., this concern having as its executive Walter Christie, famed as a driver of racing cars of his own design and construction, and a mechanic of unusual ability. The tractor was placed in commission last December and since that time it has been driven in response to all alarms within its district, as well as being demonstrated at the desire of Commissioner Johnson and other officials for the benefit of visiting firemen. This is, so far as is known, the first two-wheel tractor ever utilized for fire department purposes, and it is the only gasoline tractor of this type that has been placed in service in any municipality.

For years Mr. Christie built and drove racing cars in which the engine case formed the front axle and the drive was direct from crankshaft at high speed. These machines were driven in this country and abroad. While all others accepted the application of the power to the rear wheels as final Mr. Christie was convinced he was correct in his belief and continued to devote himself to experimental work. The results were so satisfactory that the company was organized to produce tractors for any service with capacity up to 25 tons.

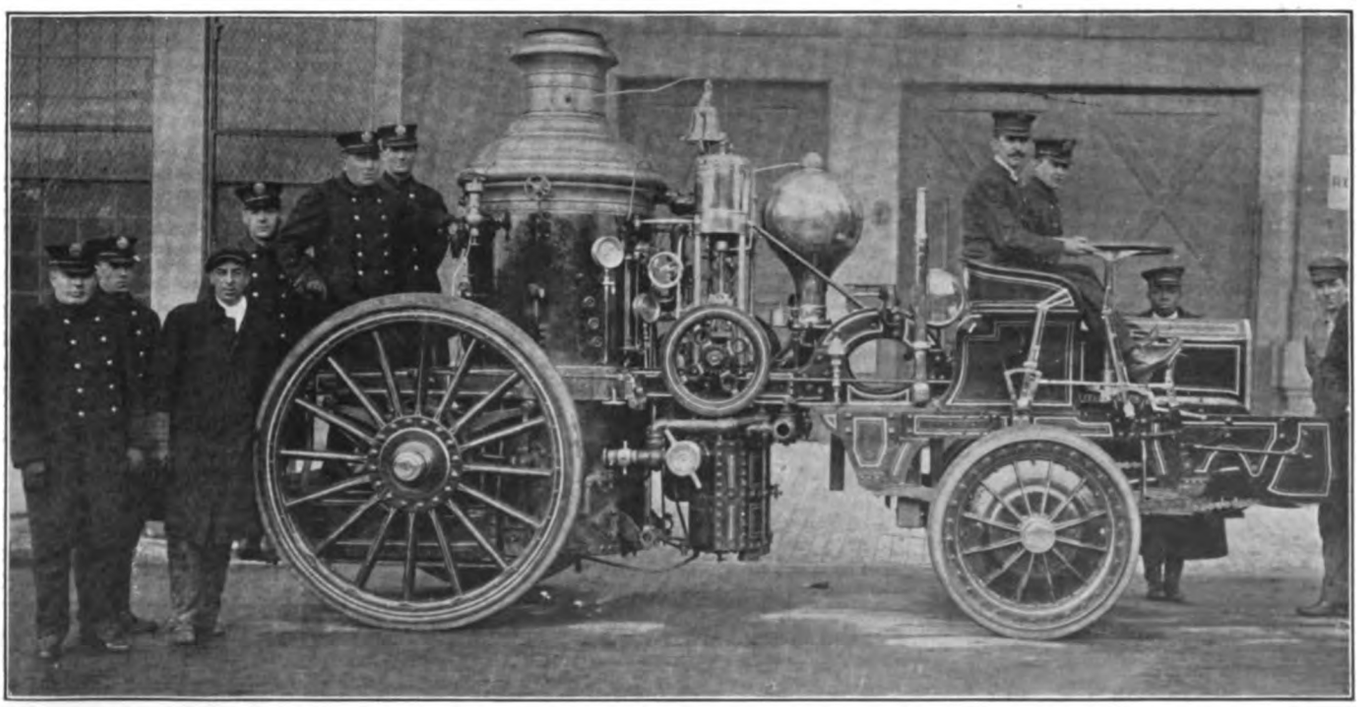
Examination of the accompanying illustration will show that the "gooseneck" of the frame by which the boiler, engine and pump of the steam fire pump are supported is mounted at the rear of the tractor. The connection is rigid. Forward of this connection is the tractor. This type of tractor is driven by a 90 horsepower engine and so far as radius of movement is concerned it is limited only by the fuel supply. The tractor is very heavily built, to endure under all conditions of service.

An explanation of the principles is desirable because the tractor in no way resembles the racing cars built by Mr. Christie. The power plant is carried well forward of the axle. The tractor is mounted on two disc wheels and supported by a heavy dead axle on which the wheels revolve. Above this is the live or counter axle, which is in reality a jackshaft. This jackshaft is fitted with a heavy spur gear differential and with universal joints at either end which have a wide radius of movement. At the ends of the jackshaft are spur pinions which are meshed into internal gears contained within the housings of the tractor wheels. The power is transmitted through a gearset of the progressive type, giving two speeds forward and reverse (high speed direct) and by a chain from the transmission shaft to the jackshaft, there being no change whatever in the relation of the engine shaft and jackshaft.

The universal joints in the jackshaft and the knuckles and wheel pivots of the dead axle permit a 30-degree movement of the wheels by means of the steering wheel, the usual radial allowance for turning. There is a turntable on which the tractor is swung by a worm gear driven direct from the transmission gearset case, this being operated by a movement of the same lever that changes the speed ratios, and by this the turntable may be moved 60 degrees more, so that the wheels may be at right angles to the original path of the tractor. This will permit the engine to be turned in a circle with the rear wheels as pivots.

One of the most important features is the fact that when a turn is made under ordinary conditions of driving the tractor wheels are driven, but to make a sharper turn might be dangerous with the engine driving, so that as the power is applied to the turntable the clutch is automatically disengaged and the tractor makes the shorter turn under its own momentum and engine power, and there is no possibility of an accident through inadvertency or loss of control.

The tractor is extremely business-like in appearance, and yet it is not unsightly. Its design is somewhat a de-



Christie Tractor, First Front Driven Machine in Fire Departm ent Work, Made by Front-Drive Motor Company and in Service in New York City.

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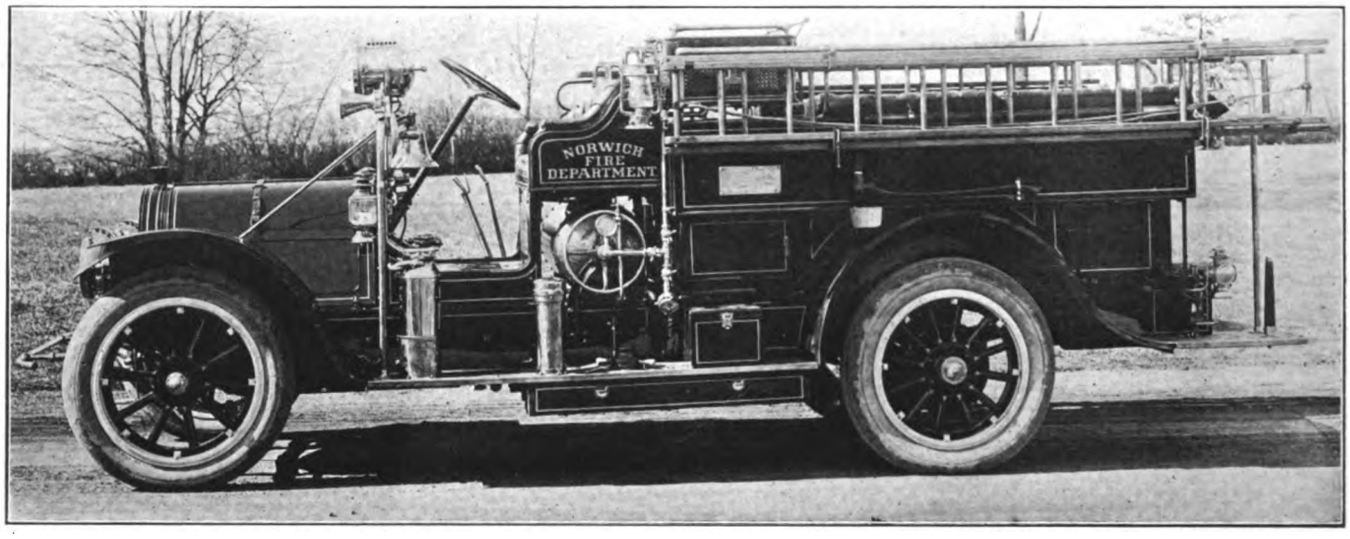
parture from conventional automobile practise. The engine of the first tractor, that which is seen in the illustration, is located longitudinally in the chassis frame, but the motors of all others will be placed transversely, which will be the type that has been described. The transverse motors will be carried relatively further forward of the axle, this change bringing about two results, the direct transmission by chain from transmission shaft to jackshaft, and the greater weight upon the forward wheels, which is especially desirable because of their tractive effort.

The engine is built for extreme service. It is a four-cylinder four-cycle type with engine case and transmission gearset case cast in a single unit, the case being semi-steel and having great strength and extreme simplicity. The bore is 5.5 inches and the stroke seven inches, with a maximum speed of 1500 revolutions, the rating by the S. A. E. formula being 48.4 horsepower. With the maximum speed the engine has 1750 feet piston travel a minute, which is 75 per cent. more than the basis for the S. A. E. standard and with the ratio of bore to stroke of one to 1.27 the rating of 90 horsepower is not too high. The crankshaft is 2.75 inches diameter at the bearings and the bearings are 3.5 inches length, with annular ball bearings at the end of the shaft carrying the transmission. The clutch is a specially designed disc type, with cork inserts to insure certainty of clutching and ease of engagement. The drive from the clutch to the transmission is through a pair of spur gears. The transmission is with a ratio of reduction of six to one on high speed, 12 to one on low speed, and 14 to one on reverse, the high speed affording a variation of from eight to 30 miles an hour through engine flexibility. The transmission gears are of Krupp chrome nickel steel, heat treated and hardened.

The motor is lubricated by a combination force feed and splash system. The ignition is by a specially constructed magneto and by battery and transformer coil, two sets of spark plugs being used. The cooling of the motor is by water circulating through the water jackets and a large honeycomb radiator installed in a pocket frame that is lined with leather to prevent strains and stresses, the circulation being by a pump of large capacity. A fan forces a strong draft of air through the radiator at all times. The carburetion is by a special three-jet type of instrument, controlled by a hand lever on the steering wheel and a foot accelerator. The ignition advance and retard is by a hand lever on the steering wheel.

The tractor chassis frame is a heavy steel channel section with all the joints of the cross members strengthened by box gussets. This frame is carried on very large springs installed on the main axle, which is a 30 carbon steel forging, 2.5 inches width and four inches depth, this axle also carrying the jackshaft or live axle with its heavy differential of spur gears of Krupp chrome nickel steel, and driving shafts of the same material with large universal joints. The wheels are of steel, the outer disc supporting the axle bearing and the inner carrying the large internal gear, 22 inches diameter. The wheels are rigidly mounted on annular ball bearings and are shod with solid rubber tires. The tractor brake is direct connected to the live axle and it is geared six to one on resistance. Besides this there is a brake set operating on the wheels of the pumping apparatus.

The turntable is one of the most ingenious devices of the apparatus, as it is motor actuated. The table is made with a frame that is bolted to the chassis frame, this portion being of extra heavy angle steel and carrying the lower section. The upper section carries the "gooseneck" connection with the pumping engine. The turntable is locked in position until it is desired to turn in a sharper radius than is permitted by the wheel lock and then by moving the change speed lever into a specially arranged slot in the gate the power of the engine is applied to turning the table by means of the worm gearing. By this device the engine may be turned in its own length and can be handled under extreme conditions.



Pope-Hartford Combination Chemical and Hose Wagon Recently Placed in Service with the Department in Norwich, Conn.

The wheelbase of the tractor drawn engine is exactly the same as were it drawn by animals because the tractor is mounted with its wheels well back. Under the tractor steering wheel is a heavy chassis frame member which curves downward and carries the rack and pinion steering gear on the turntable, and it is connected with the linkage by which the wheels are turned under ordinary conditions of driving. The steering or pivoting is the centre of contact of the road wheels with the road and the centres of the driving wheels, so that turning the tractor is comparatively easy.

The tractor steering wheel is at the right side of the tractor chassis and the hand lever is at the side of the driver's seat. On the footboard are the clutch and the service brake pedals and the foot accelerator. Under the seat is carried the gasoline tank, the feed being by gravity to the carburetor. With the manner of attachment of the steam fire pump the apparatus appears practically to be a single construction, instead of two separate units.

These tractors are to be built for all purposes and with industrial vehicles the speed will be somewhat lessened be-

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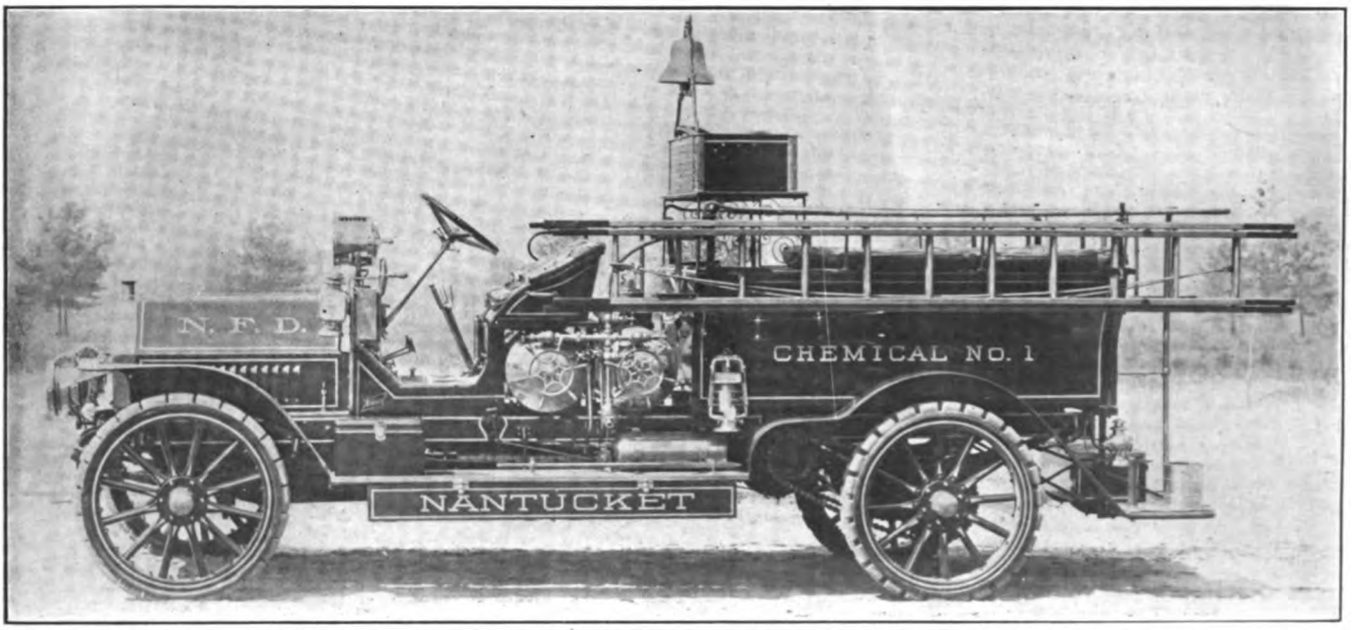
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cause of greater reduction of the power. It will be possible to utilize different forms of bodies, for varying work, the exchange being a comparatively easy matter. The size of the tractor will depend upon the service for which it will be used.

POPE-HARTFORD FOR NORWICH.

The working efficiency of the department in Norwich, Conn., was increased recently by the installation of a new Pope-Hartford combination chemical and hose wagon, which was driven over the road from the factory of the Pope Manufacturing Company, Hartford, Conn. The car, which is illustrated herewith, is propelled by a four-cylinder, water-cooled motor rated at 50 horsepower, but capable of developing considerably more than this under test.

The body is fitted with seats running lengthwise, these accommodating a crew of eight men. The front seat provides for two more. The fire fighting equipment includes 1000 feet of 2.5-inch double jacketed water hose, and a 35-gallon chemical tank with extra jar and holder, and connection for 2.5-inch fire hose. The tank is located under the driver's seat, and a metal basket is provided behind the seat for 250 feet of chemical hose. In addition to this, a full complement of firemen's tools, a 17-foot extension ladder and a 12-foot roof ladder are included.



Knox Chemical Wagon Built for the Nantucket Department a nd the Only Mechanically Propelled Vehicle with the Right to Operate on the Island.

KNOX CHEMICAL FOR NANTUCKET.

Although the people of Nantucket, Mass., went to the legislature some few years ago with a sucessful appeal for a special statute forbidding the use of automobiles on the island, the city of Nantucket has purchased the Knox combination chemical and hose wagon shown in an accompanying illustration. The car, constructed by the Knox Automobile Company, Springfield, Mass., was delivered on the island last month, and now enjoys the distinction of being the only mechanically propelled vehicle with the legal right to be operated in that territory.

The chassis is the regular 50 horsepower model to which the Knox company fits fire fighting apparatus. In addition to two 35-gallon chemical tanks and the necessary chemical hose, it carries 1500 feet of regulation fire hose and all the other usual fire equipment. One particular feature is the fitting of a Perkins automatic lighting system, by which the searchlight, side and tail lamps may be ignited instantly from the seat by pushing a button. In common with other Knox vehicles of this type, it is supplied with siren horn, an ordinary automobile horn and a locomotive bell.

The car has attracted no end of attention throughout Massachusetts, it having been sent over the road from the factory in Springfield to New Bedford, whence it was taken to the island by boat. E. P. Crocker, who will be the only licensed operator in Nantucket, has been at the Knox plant becoming thoroughly familiar with the construction and method of operation. In addition to the Knox combination vehicle, the fire fighting equipment on the island includes two hand drawn steamers.

DANBURY WITNESSING TESTS.

Danbury, Conn., is considering the purchase of a motor fire engine. Chief Thomas A. Lounsbury and Engineer Elmer H. Barnum, accompanied by the members of the fire committee, Alderman Michael A. Schweitzer, Councilmen Gilbert Horner and Charles A. Schoonover were recently guests of the Victor Motor Truck Company at Buffalo, N. Y., where they witnessed the test of a Victor fire engine. This was the same model as the one recently installed in Middletown, Conn., by the Victor concern, but considerably larger. An American-LaFrance engine, built for Pueblo, Col., and a Knox engine have been demonstrated in Danbury.

AHRENS-FOX FOR DETROIT.

Detroit, Mich., placed an order for four pieces of motor driven fire fighting apparatus with the Ahrens-Fox Fire Engine Company of Cincinnati, O., the latter part of May. The contracts call for three automobile pumping engines and one combination chemical engine and hose wagon. Work on the machines has been commenced by the Ahrens-Fox company. The Cincinnati firm's bid was considerably higher than that of several other companies, but the rapid advancement in the effectiveness of its automobile fire engines had its influence with the department officials in Detroit. The Ahrens-Fox motor engines have attracted unusual attention of late, and fire chiefs in various parts of the country are visiting Cincinnati as a result.

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FAIRHAVEN SEEKS CHEMICAL.

Fairhaven, Mass., is awakening to the need of motor driven apparatus in its fire department, and the proposition of installing a combination chemical and hose wagon at a cost of about $5600 is being considered. Several petitions have been circulated for the purpose of bringing the matter before the next town meeting. Promoters of the petitions advocate the installation of a double-tanked chemical, so that one can be charged while the other is in use. The town would find by the adoption of such a piece of apparatus that there would be a great saving in the maintenance of the department, while the outlying districts would be protected better in every way.

AMERICAN-LaFRANCE FOR LEADVILLE.

A new American-LaFrance motor combination hose and chemical car made by the American-LaFrance Fire Engine Company, Elmira, N. Y., has been placed in commission at Leadville, Col. It is a four-cylinder machine with a 40-gallon tank.

POPE-HARTFORDS IN CALIFORNIA.

The town of Corona, Cal., has placed an order with the Pope Manufacturing Company, Hartford, Conn., for a Pope-Hartford chemical and hose wagon. Among other California cities and towns which have installed fire fighting apparatus of this make are San Francisco, Berkeley, Venice, Santa Barbara, Santa Rosa and San Bernardino.

PIERCE-ARROW FOR CHIEF.

Chief Thomas R. Murphy of San Francisco, Cal., is to have a six-cylinder, 48 horsepower Pierce-Arrow car, made by the Pierce-Arrow Motor Car Company, Buffalo. The fire department of that city bought its first Pierce-Arrow in 1910, and the service which it has given has been so satisfactory that when it was decided to add another, it was believed best to get one of the same make, despite the fact that its price was nearly $900 more than other competitive bids.

PERU WANTS EQUIPMENT.

Attracted by the success of motor driven fire-fighting apparatus in Indianapolis, Peru, Ind., is considering the purchase of one or more pieces. The department officials are making a thorough investigation into the cost of operation and maintenance, and although nothing absolutely definite has been decided upon, it is very probable something will be done in the matter in the very near future.

LADDER TRUCK FOR NEW YORK.

An automobile fire truck with a 75-foot ladder recently had a test in New York City before Fire Commissioner Johnson and Deputy Commissioner Olvany. The result is claimed to have been satisfactory and the machine will probably be accepted for the city. The truck was made in St. Paul, weighs 18,500 pounds and costs $11,500. The trial showed it capable of making 20 miles an hour. If accepted it will be the first one in service in New York City.

WEBB DOES EFFICIENT WORK.

So efficient was the work of a Webb automobile engine, made by the Webb Motor Fire Apparatus Company of St. Louis, at a recent fire in New Haven, Conn., that there is talk of eventually providing all the companies in that city with similar apparatus. There was a time when the members of the fire department and citizens in general were skeptical concerning the ability of the engine to cope with a bad fire, but this feeling has passed. As a result of a recent claim the Webb engine pumped for 11:11:00; some of the time at the rate of 800 gallons a minute, feeding two streams of 500 feet each. After the blaze had been extinguished the engine was set to work pumping the water from the ruins, working with a suction pipe, fitted with strainers.

TO PROTECT OUTLYING DISTRICTS.

Chief Dahill of the fire department in New Bedford, Mass., advocates the installation of an automobile truck at the central house in his city. Under the present conditions the horse drawn truck is obliged many times to make runs of two, three and even four miles to the mill and outlying districts. By having an automobile at the central station and placing the horse drawn apparatus in one of the outlying stations Chief Dahill points out that the city would be covered more efficiently and economically.

MONTREAL REPLACING HORSES.

The W. E. Seagrave Company of Walkerville, Ont., is building an elaborate equipment for the Montreal fire department, a considerable part of which will be in use within a month. A motor engine, ladder wagon and hose wagon will first be installed at headquarters, Craig street. Later some of the other horse drawn equipment in the city will be replaced by automobile apparatus.

KNOX AND AMERICAN-LaFRANCE.

The Knox Automobile Company, Springfield, Mass., and the American-LaFrance Fire Engine Company, Elmira, N. Y., recently secured contracts from the city of Pittsburg, Penn., for supplying six pieces of motor driven fire fighting apparatus at an aggregate cost of $31,500. Each concern received a contract for three machines to cost $5250 each. Mayor William A. Magee and Director H. B. Oursler of the department of supplies appeared before the finance committee of the council in behalf of the successful bidders.

TRUCK FOR ST. JOHNSBURY.

St. Johnsbury, Vt., is to purchase a motor fire truck. The city wants a 70 horsepower machine, guaranteed to make any hill in the village at about 48 miles an hour, for which it is to expend $5800. The town wants the truck ready for use Aug. 1.

IN THE MARKET.

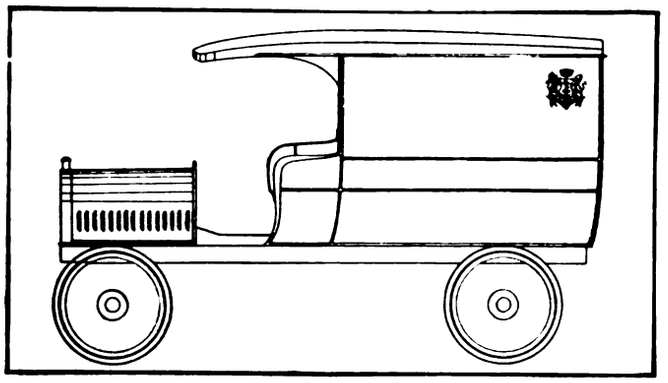
The following cities are contemplating the purchase of motor fire apparatus: Cincinnati, O., bond issue of $160,000 recommended; Waltham, Mass., appropriation of $6000; Alameda, Cal., engine, and hook and ladder truck; Santa Clara, Cal., combination chemical and hose wagon; Anaconda, Mont., hose and chemical wagon, and aerial truck; Dallas, Tex., pumping engine and two combination wagons; Hingham, Mass., combination and chief's wagon; Somerville, Mass., appropriation of $4800 for combination wagon; Revere, Mass., combination and chief's wagon.

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ENCLOSED DELIVERY WAGON BODIES.

Equipment Designed to Meet the Requirements of Widely Varying Service, in Differing Sizes, and Adapted for Year-Round Work.

IT IS a fundamental of engineering that a structure must be solidly supported to endure, and what is true of an immovable object applies equally well to what is movable.



Type A, a Full Panel Body, with Open Seat and Hood.

That is to say, that any vehicle, as is any other structure, is constructed to carry a certain load, and if that load is not so distributed that it is carried with relation to the construction then stresses are caused that are not always provided for. As a matter of fact any vehicle is supported by the four wheels and each wheel is necessarily expected to sustain a certain proportion of the weight of the whole. This primarily applies to the chassis. When the body is installed there is a fresh distribution, and as the wagon is loaded the weight is varied as the load is placed. Directly the machine is driven the variance in the surface of the highway lessens or increases the stresses proportionate to the elevation or depressions, to the speed and to the flexibility of drive.

Of course any motor wagon is expected to be worked under differing conditions and what is supposed to be a safe margin of strength is provided for in the construction, but every failure is due to inequality of stress, insufficient or faulty material, or poor workmanship. Poor workmanship is a condition for which the builder is entirely responsible, and the same may be said of insufficient material, but a defect that will defy inspection may exist and only be developed after a considerable period of use. Inequality of stress is dependent upon the judgment of the driver and may be due to conditions that might be avoided or lessened through care.

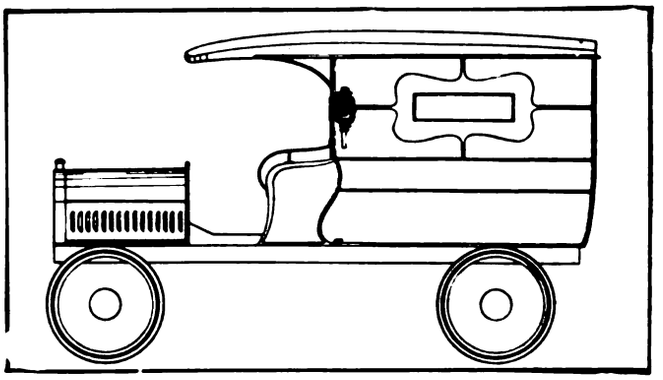
With the cheaper forms of vehicles it is not to be expected that the design has been as carefully developed as with those higher in price, and neither is it to be assumed that the same quality of material is used. It is true that lightness may not necessarily mean a sacrifice of strength, provided the metal is well chosen, but reduction of proportion of a standard can only be met by the substitution of quality that will compensate for the difference in weight. But whatever the design and whatever the material it is certain enough that limitations have been established, within which it is reasonable to assume the construction will endure with not more than normal deterioration.

The need of limiting a load carried by a vehicle to the capacity fixed by the manufacturer is a subject that seemingly permits of no argument. Every practical man will acknowledge this, yet with this fact emphasized from every angle these men will tolerate, and perhaps exact, their employees carrying loads in excess of the limit established. They will assume that all work that can be accomplished beyond the normal standard is clear gain. Strangely enough they will believe what common sense dictates cannot be possible. Not only this, they will constantly overload a vehicle and believe they are "getting something for nothing", but they at all times endeavor to conceal this overloading from representatives of the chassis maker, largely, if not wholly, because of the guarantee as to service.

In one sense a limitation of capacity is the prime reason why the owners and drivers purposely exceed it. The designer has made all his estimates of strength on constants—where the vehicle is idle and the load equally supported. To these he adds what in his judgment will be sufficient to afford the factor of safety desired. The stress cannot be computed; neither can the character and quality of the metal be insured. Standards must be accepted and relied upon. These facts are not considered by the owners. While they desire the protection of the vehicle guarantee they generally invite or precipitate wear or damage by deliberately violating the conditions of the guarantee. As a matter of fact it may be justly maintained that these men, were there no guarantee, would be quite as careful not to overload their machines as they are generally as desirous of overloading them.

Theoretically body construction ought to be quite as carefully worked out as to engineering details as is the chassis. Even greater care would not be injudicious. Each body should be so constructed that the load could be equally distributed and with a certain centre of gravity, so that there would never be more than a specified weight upon any given support. Obviously as the height of the load is increased the centre of gravity is raised and this means that the lines of support are changed correspondingly, causing stresses upon the construction that were not provided for, and which may be excessive.

Body builders of experience believe that each body ought to be constructed for the work that the vehicle is to do. That is, the freight to be carried is to be measured as to bulk and weight and a design made that will permit merely the maximum load. Such a body may be large or small as the work will necessitate. To illustrate, a truck body was recently made for the Carnegie Steel Company for the haulage of steel billets, but while the load was six tons the body was of a size usually installed on a three-ton

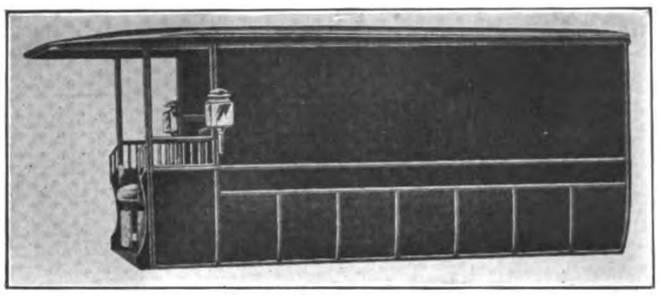


Type B, a Full Panel Body, with Open Stanhope Seat.

chassis, with, of course, heavier construction. The value of this equipment was that it concentrated the load and insured better distribution, and it guarded against overload-

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ing. The wisdom of the small installation is apparent. At the other hand the truck that is to carry a light bulky load may have a body considerably in excess of the standard.



Type C, a Full Panel Body, with Half Vertical Panels.

By standard body is meant the size accepted by builders as being adapted for certain works, that is, where the freights may be decidedly varied. For specific work capacity is determined by the weight of the freight a cubic foot. For instance, sand will weigh approximately 100 pounds to the cubic foot, contracting material about 3500 pounds to the cubic yard, brick 2700 pounds to the cubic yard, bituminous coal will require about 34 cubic feet to the ton, anthracite coal 36 cubic feet to the ton, and so on. If packages are to be carried the weight and bulk are figured and the body space designed that will provide for the chassis capacity. Small, heavy boxes or cans may require but a small part of the body constructed for carrying larger and lighter units, and these may be carried in the larger vehicle quite as economically and as safely, provided they are properly loaded, but it is apparent that unless the weight is equally distributed serious damage may be wrought.

For the purpose of illustrating the sizes of bodies regarded as standard the following statement of floor areas is given:

Load Capacity Pounds.	Length In.	Width In.	Floor Area Sq. Ft.
1000	96	54	36
2000	108	56	42
3000	120	66	55
4000	126	70	60.25
6000	144	72	72

Taking these as the recognized sizes it will be seen that there are not distinct ratios of floor area to capacity. In fact the comparisons will show the following interesting figures, taking the 1000-pound body as the basis:

Load Capacity	Floor Area	Load Increase P. C.	Floor Area Increase P. C.
1000	100	....	....
2000	116.66	100	16.66
3000	152.70	200	52.70
4000	167.36	300	67.36
6000	200.00	500	100.00

By this it will be seen that the 6000-pound body is constructed to carry that weight, assumedly, but it has only double the space to carry five times the load, which means that the vehicle is expected to convey packages or articles that weigh 2.5 times as much a unit as the 1000-pound wagon, to maintain uniformity as to load in both. In other words it is seemingly assumed that the greater the weight carrying capacity of a wagon the bulk is decreased. Were this so there would be a specific restriction as to height of load, but this is not defined unless in the case of the closed body. It may be said that the fully enclosed body is the only form that will limit the bulky load, while it will not be as poorly loaded as the open equipment, where the freight may be packed or piled on at either sides or ends.

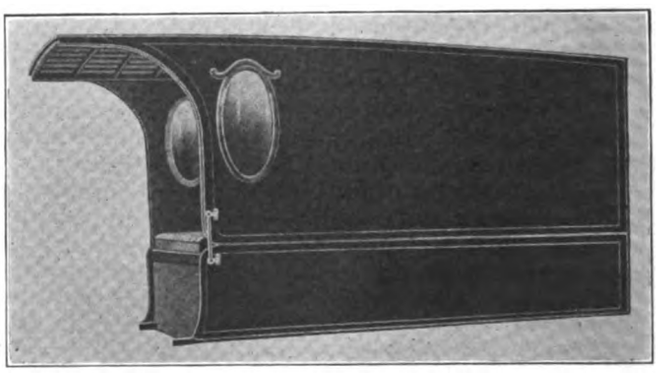
Considering several forms of standard covered bodies it will be noted that these are made to specifications adopted after long experience with vehicles, and these are designed to afford the greatest measure of serviceability within certain limitations. These will be designated, for the purpose of consideration, as types A, B, C, D, E and F. Type A, for instance, may be built to any dimensions, aside from the standards, and yet to meet the average requirements the standard sizes will be as follows:

	Carrying Space				
Capacity, Pounds	Area, Sq. Ft.	Length, In.	Width, In.	Height, In.	Body Capacity, Cubic Ft.
1000	36.00	96	54	60	180
2000	42.00	108	56	64	224
3000	55.00	120	66	66	325
4000	60.25	126	70	68	348
6000	72.00	144	72	70	420

Type A bodies will, according to the above tabulation, be identical in every respect save the proportions, and these may be fitted to any vehicle chassis in which the load as it may be distributed will not cause an excess stress. The design is known as a full panel body with an open seat and hood. It is a graceful appearing construction that may be utilized for delivery of all manner of commodities of average bulk and weight, but obviously not one of these could be economically employed for the haulage of furniture or similarly light but bulky commodities. That is, the body could not take the load that ought to be carried to ensure a reasonable profit through haulage. For such work the open vehicle is undoubtedly the better, but for the all-around delivery, which may be made without regard to the weather conditions throughout the year, the enclosed body is decidedly the better. There is the difference in cost, to be sure, and the appearance of the enclosed body is something that is of considerable importance, so that the expense of maintenance (finishing and repairing) as well as cleaning, would be larger than for the open equipment. But the other qualities more than offset the additional expenditure.

This type of body may be installed on the comparatively light chassis and utilized for delivery by the florist, the laundry, the cleaner, the furrier, the department store, the milliner, the clothier, the shoe shop, the haberdasher, and the like, while the larger sizes could be utilized by other businesses where there was desire for the advertising value and the prestige of modern methods, as well as the protection against loss and theft that is insured by the rear doors and a lock when the driver is left unattended. Bodies of from 2000 to 6000 pounds capacity could be utilized to admirable advantage by department stores and these would have sufficient capacity to make delivery of a large number of packages, being especially adapted to long routes, where many bundles are carried and where a driver and one or two helpers are necessary.

It will be noted that this body is built with plain, long

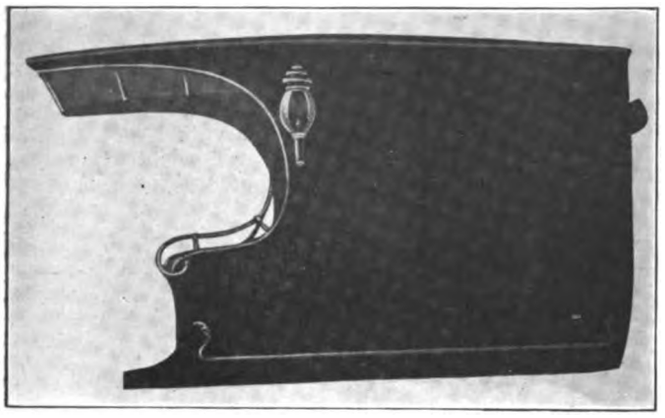


Type D, Plain Full Panel Body, with Oval Lights.

panels and the lines are generally straight or slightly curved. The panels are of a size and form to permit attractive ornamental lettering, that illustrated being a dem-

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onstration of the possibilities in this direction. There is a dignity and consistency in the design that is appropriate to a business of repute.



Type E, a Full Curved Panel Body, with Open Seat.

Turning to type B a body is shown that is designated a full panel, with an open stanhope seat. There is practically no difference in the size or the capacity of the carrying space, but it will be observed that with this the single upper side panel of type A has been replaced by four smaller panels and in the centre is a wide frame in which is set a single light of beveled-edge glass. The side panels of the seat have curved lines to produce the stanhope effect, and the contour of the brackets supporting the hood are more pronounced, though the hood itself is practically the same. The high side lamps of coach design enrich the appearance of the entire construction. This body is made in the same sizes as is type A. It is adapted to the same uses but perhaps would be in lesser demand because of the more generally ornate appearance, while its greater cost would be a considerable influence against it with those who gauge their expenditures by initial economy.

Referring to type C, is found a design known as a full panel, with vertical half panels. The effect of this, which is ordinarily built for 1000, 2000, 3000 and 4000 pounds capacities, is decidedly a contrast with the two types previously referred to, but as a matter of fact the load space is precisely the same as for these. This is due to the large upper panel, the narrow panel beneath it, and the shortening effect of the seven vertical panels. The square lines of the seat panels and the height of the side rail, with the pillars supporting the canopy, and the shortening of the bonnet or hood all convey the impression of length. This form of body is as well suited for the same classes of deliveries as are the others, but it must be treated with an entirely different form of ornamentation to obtain the same character of attention possible with them.

In type D is seen a full plain panel body with the side panels carried forward to form the sides of the driver's seat, this affording the driver more shelter than any of the others. The brackets that support the canopy are incorporated with the side panels, as are the seat panels, the forward ends of the side panels having curves that are emphasized by narrow mouldings. The driver is given a view at either side by large oval lights, well above the seat, these being set in plain but substantial frames. Aside from this there is no ornamentation save the large side handle beside the seat, this being desirable to prevent straining the side frame by those alighting from or entering the driver's seat. There is a severity to this design that is largely dissipated when the sides are used to display the name and business of the owner. Type D is made in the same sizes only as are type C.

The type E body is the smallest of the series, this being built with capacities of 1000, 2000, and 3000 pounds. The design is specified as a curved panel body with open seat and long extended hood. The panels of the body are with straight lines until the seat is reached, when the sides of the seat panels and the brackets supporting the hood are curved with graceful effect, the sides of the seat being ornamented with handsome hand rails. High at either side is mounted a lamp that gives a pleasing relief. There is abundant side view for the driver. The rear of the body as designed is closed by a curtain. This equipment is intended for all-around service.

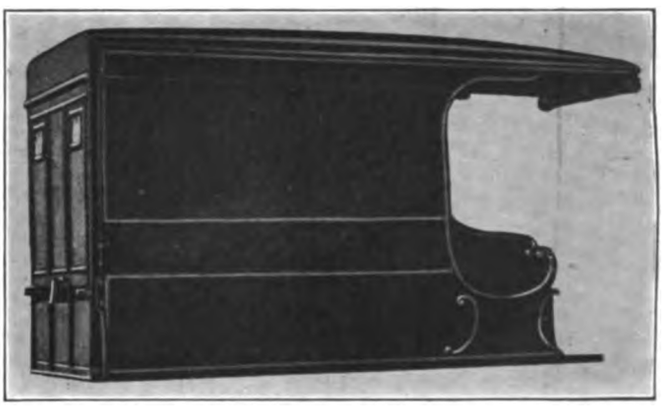
The body illustrated as type F is standardized, as is type E, to 1000, 2000 and 3000 pounds capacities. This is also a full panel design with an open shield seat. This construction is severely plain and yet the forward end is artistically conceived, the curves of the upper seat panels harmonizing with the brackets supporting the canopy, and wide mouldings sweeping from the hood and after dividing the seat panels, rising to finish the forward edge of the upper panels. The lower panels are established by curved upright mouldings, the forward ones embellishing the forward edges of these panels. The rear doors have small lights at the tops.

Contrasting these bodies it will be realized that while all are classified as panel designs, there is a surprising difference in appearance which would not be understood even when the qualifications are noted. Emphasis is made of this fact bcause it is decidedly improbable that the average owner of a vehicle could, without explanation, understand how six bodies, for instance, would have the same capacity and yet differ so much. The trade designation does not convey the impression that is necessary to differentiate the types. It is apparent that any one of these might be appropriate for a delivery service, or with modifications might be made to serve, and there is a sufficiently wide range in design and capacity to satisfy all ordinary requirements. The more the types are studied the possibilities for adaptation are increased.

It will be noted, further, that with these standard bodies it is desirable that they be installed on chassis where the load is distributed according to the requirement of the designer of the chassis, and that it would be decidedly unwise to select a body without reference to the chassis design and its requirements—that is, to purchase a chassis and expect to install any body desired. Neither should there be an opinion that a body can be bought that will afford the necessary character of service that can be installed on any chassis. The chassis and the body must be consistent to obtain the best service within the limitations of the chassis.

CARTERCARS FOR MILWAUKEE.

The Milwaukee fire department has ordered through the Chicago branch of the Cartercar Company, Pontiac, Mich.,



Type F, a Full Panel Body, with Open Shield Seat.

seven model R roadsters. These cars will be used by the department chiefs in responding to alarms and will add much to the efficiency of the department.

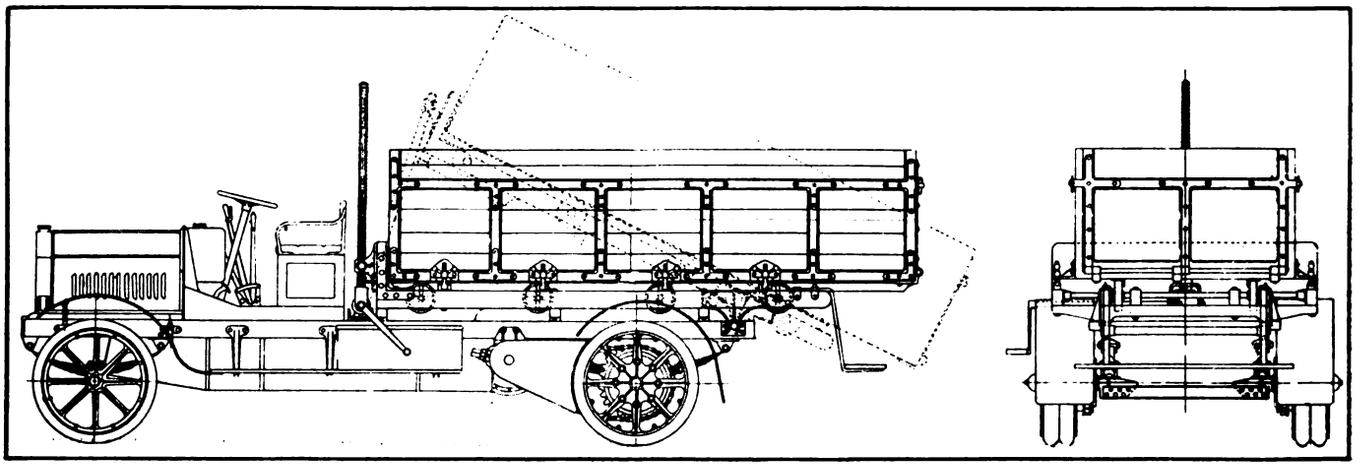
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FOREIGN TRUCK NOTES OF INTEREST

SPECIAL LACRE BODIES.

Particular attention is being paid by the Lacre Motor Car Company, Ltd., Letchworth, England, to the matter of special body equipment suitable for municipal service of a class somewhat different to that obtaining in this country. Herewith are presented the detailed sketches of a set of bodies adaptable to the four-ton chassis made by this concern, the idea being to supply the city government with wagons adaptable to various kinds of work, even where it is thought desirable to own but one chassis. It will be noted as well, that the company provides a so-called roller platform designed to aid in the easy and rapid removal and replacement of the various bodies. Although designed to be applied to the four-ton chassis, as stated, it may be added that these bodies can be obtained for other sizes of Lacre chassis, and their capacity may be varied to suit the needs of the purchaser.

In the first place, it may be well to call attention to the new Lacre chassis, in which the long experience of the company has been reflected in the effort to obtain a vehicle that may be handled satisfactorily by unskilled drivers. In carrying out this plan, no startling innovations are to be noted, the vehicles following designs which have been proved under all conditions of service.



Side and End View of Standard Dumping Body, Hand Operated, Utilized with Municipal Combination Equipment Fitted to Four-Ton Lacre Chassis.

The motor is a four-cylinder, water-cooled unit, having bore of 3.5 inches and stroke of 5.5, giving a 20 horsepower rating under the Royal Automobile Club's formula, which is essentially the same as that adopted in this country by the Association of Licensed Automobile Manufacturers, and now the standard of the Society of Automobile Engineers.

Revolutions are limited to a maximum by a heavy type centrifugal governor, which is driven off the half-time shaft and is located in the top portion of the crankcase, the governor itself being easily accessible through an inspection cover. The lower portion of the crankcase is merely an oil pump, and contains the oil pump driven by spiral gearing off the camshaft. Provision is made for removing the sump without disturbing the main crankshaft bearings, and these latter can be taken up without removing the engine from the chassis.

The lubricant is forced to the main engine bearings and connecting rod big end, through oil ducts drilled in the crankshaft and a simple and efficient gauge on the dash informs the driver as to the condition of the supply at all times. The oil pump and strainer are easily detachable, being complete in a single unit and belted to the base of the sump.

The crankshaft is of special high grade steel, and the camshaft and wristpins are case hardened. The camshaft and cams are cut from the solid. The inlet and exhaust valves are located on one side, the tappets and guides being wholly enclosed by removable dust proof covers. All valves are interchangeable and all tappets adjustable. The valves are made of nickel steel and are of specially large dimensions. The ignition on all models is fixed, the current supply being a Bosch high-tension magneto.

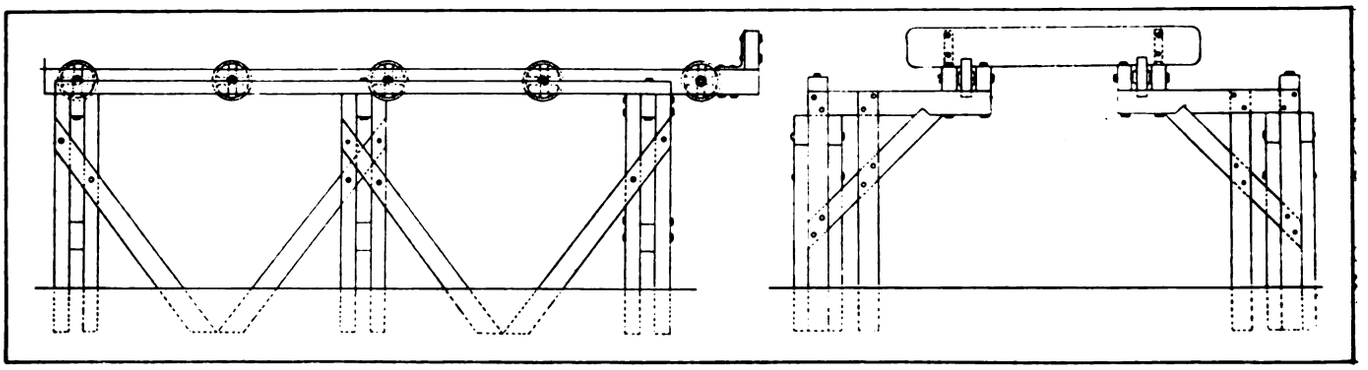
Cooling is effected by a large centrifugal pump driven off the governor shaft and very accessibly mounted. The water is circulated through a vertical gilled tube radiator of large capacity, and the fan, directly behind the radiator, is belt driven, provision being made for adjustment.

The cone clutch is leather faced. The drive to the gearbox is transmitted through a special form of enclosed spring drive, which is held to be particularly efficient. Three speeds forward and reverse are provided, and these are engaged by means of dog clutches, except the first and reverse. Final drive is by side chains. The differential mechanism on all Lacre models includes two crown gears.

Special attention has been paid to the efficiency of the brakes, the foot brake operating on a single drum fitted on a substantial extension of the differential shaft, and the hand brakes, internal expanding, operating on the rear wheel hubs. The shoes have detachable cast iron slippers, which can be renewed readily and without excessive cost. The chassis also are constructed with an exceptionably large wheel lock, so that they may be turned in a remarkably small radius.

The dumping body, shown herewith, may be regarded as standard. It will be noted that the lower structure and tipped gear are fixtures on the chassis itself, and while they may not be needed with some of the bodies which may utilized, this is considered the most practical plan. This lower structure includes the roller device, by means of which the bodies are transferred to and from the chassis. It may be added that the body is retained in position when

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Roller Platform Furnished with Set of Bodies Designed for Varying Municipal Uses, Indicating Means for Changing the Units.

on the road by swivelling clamping screws on either side, and retaining pins in front, which comprise a rapid and efficient fastening.

The rollers run in angle iron guides fitted to the bottom of the body, and as similar rollers are fitted to the platform that receives the body when not in use, it is apparent that interchanging is a simple and easy matter. It is pointed out that the work is accomplished by hand with a minimum of effort in from 10 to 15 minutes, without the aid of a crane or tools of any kind. The roller platform is so arranged as to be at the same height as the chassis platform, facilitating the removal and replacement of the body.

The dumping body has a capacity of 153 cubic feet, capable of being tipped by hand to any angle. The sewage disposal body has a capacity of 112 cubic feet, or approximately 730 gallons. It is built along lines similar to those utilized as horse wagons in this work, and the fitting of the elevating hoist makes it possible to tilt the tank to any position, so that the entire contents may be emptied. Baffle plates on the inside tend to stop the sway of the liquid when the vehicle is in motion.

The water tank has a capacity of 800 gallons, and is equipped with a sprinkling attachment, as well as apparatus for flushing the gutters. The valves for operating the sprinkling device are conveniently placed at the driver's seat, making it unnecessary for but one man to accompany the car on the road.

Other bodies may be fitted, among which may be mentioned a combined sprinkling machine and street sweeper, etc. All are constructed throughout of high grade material and the design follows the best engineering practise, having in mind the work which they are expected to perform.

INTERESTING GARBAGE WAGON.

For the past six months, Rouen, France, has been using successfully a motor truck, which has a four-fold purpose—the collection of house refuse, street watering and washing, and to give assistance in case of fire in pumping out flooded buildings. The city has entirely done away with the use of horses in the collection of garbage, street washing and watering, and has found that the work is done more quickly; that there is need for much smaller staffs of men, and that there is a great saving when a comparison is made with the old method.

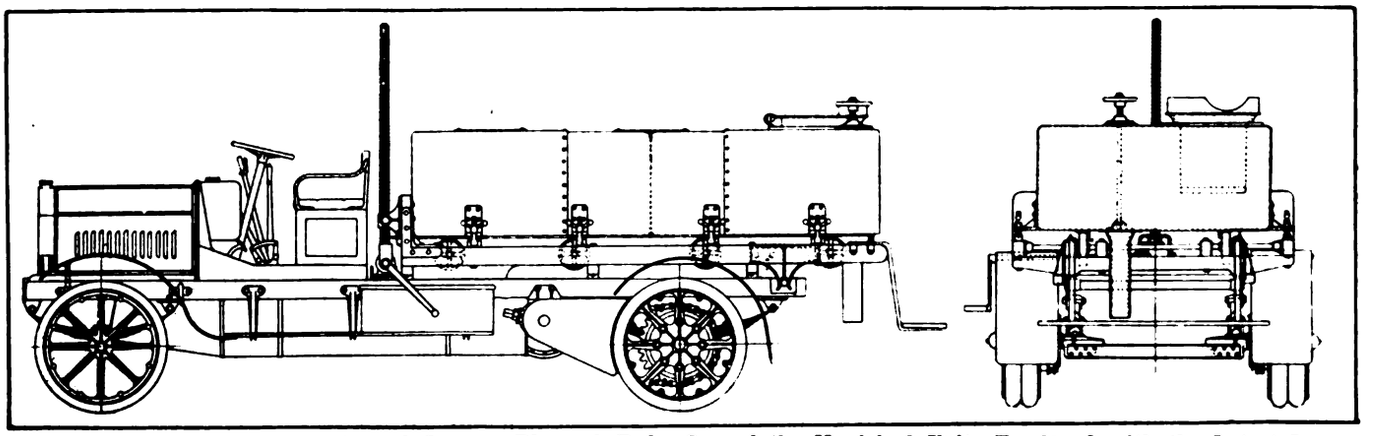
Rouen is really a pioneer in this line, and while other European cities are hesitating, the work goes on in this French city at a great saving of time and money. Through an arrangement with the firm of Harle et Cie, of Paris, the city employs a fleet of eight motor vehicles, these being sufficient for all requirements.

In France each apartment house is provided with a common bin for refuse, these being placed on the sidewalks in the early morning and emptied into the scavenger's cart. As the bins are placed at intervals of 10 to 15 yards, it was a problem at first, on account of the slow speed necessary, to have them emptied into a motor truck. Paris has experienced this difficutly, which it has sought to eliminate by the use of electric chassis, but Rouen overcomes the trouble in a much different manner.

Here the motor trucks are provided with eight receiving bins, carried in a double row on a special body, with provision for lifting them on and off the truck by machinery. Each bin has a capacity of about 280 cubic feet, and at night the trucks leave them about the city at specified places.

They are received by laborers, placed on wheelbarrows and a house-to-house collection is made for the refuse. After the household bins have been emptied, the hoppers are left at the edge of the sidewalks at an appointed stand. The work is carried on all night all over the city, and in the morning various street corners are lined with bins waiting to be collected and carried away. That the saving may be as great as possible these must be collected with little waste of time and with a minimum of manual labor.

The overhead gearing is so arranged that the four ref-



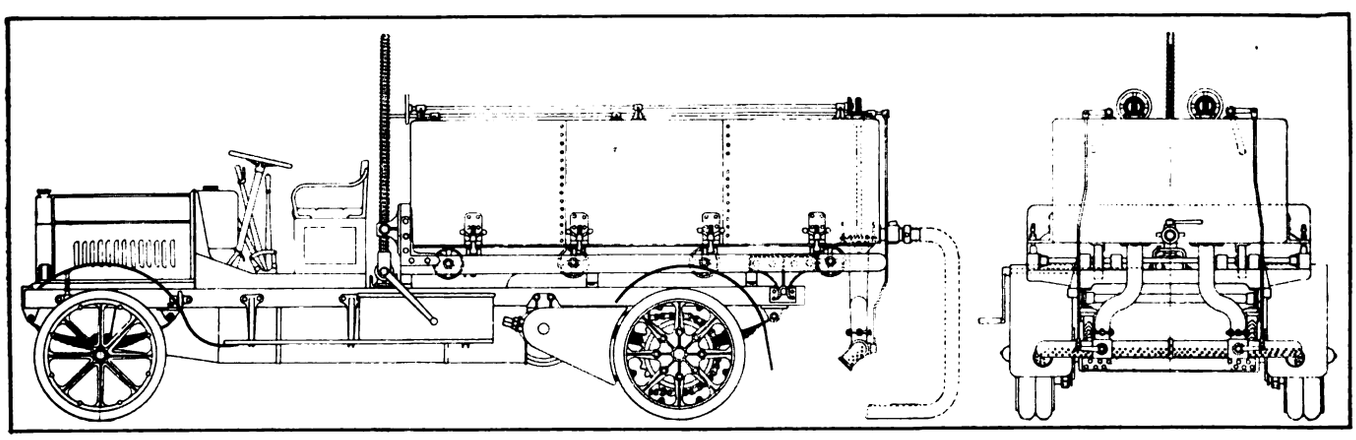
Indicating Detailed Construction of Sewage Disposal Body, One of the Municipal Units Employed with the Latest Lacre Combination.

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use carriers on one side of the body can be handled all at a time or singly as the operator desires. Although apparently complicated, the operation has been so simplified that it can be handled by one man, who can control the entire mechanism if necessary. It is usual, however, to carry two men on each truck, the second one to hook the bins to the gearing.

The loading and discharging mechanism, consisting of two steel columns, united by a fixed cross girder and a movable transverse member to which the bins are attached by chains, gets its movement primarily from the gearbox, and the control is through the usual change speed lever, there being six gear positions—four for forward speeds, one reverse, one for discharge. The truck can unload and load to either side, and the bins may be placed at variable distances from the edge of the curbing within certain limits. At the furnaces, where the refuse is destroyed, a specially constructed travelling crane has been installed to handle the bins. This is in charge of one crane man and an attendant.

The entire rear of the vehicle is occupied by two permanent shallow water tanks with a capacity of about 580 gallons, making the truck serviceable as a street sprinkler and washer. The bins are carried above these tanks, which are made separate in order to provide for the driving mechanism of the crane. They are, however, united by a pipe which permits of the use of one discharge and one filler. The sprinklers are to either side of the vehicle, just behind the steering wheels. They can water a street 50 feet wide, and are provided with valves, operated by the driver, so that they can be shut off partially or entirely as the case may require. The pump may be driven when the truck is in motion or at a standstill.



Side and Rear View of the Watering Tank and Street Flushing Equipment Interchangeable with Other Bodies on Lacre Chassis.

The trucks are shod with steel rimmed wheels, rubber being considered too expensive, and everything is made to withstand wear and tear. Aluminum has been done away with almost entirely, the crank chamber and gearbox being of bronze and the differential housing of cast steel. The motor is a four-cylinder unit, 105 mm by 150 mm, bore and stroke, with its cylinders in pairs. Ordinarily benzol is the fuel employed, although gasoline can be used.

VANS FOR MILK COLLECTION.

Farmers in the Yeadon district of England are considering a proposition to transport milk by motor vans from their farms to Leeds, the leading distributing point in that vicinity. A meeting of 20 of the leading milk producers in that district was held recently, when the subject was discussed. Many of the farmers showed considerable surprise when told that the expense of running a motor vehicle loaded is very little different to what it would be to operating an empty one. As an example of what motor propelled vehicles can do, it was pointed out to them that a mail van in the district, travelling from 800 to 900 miles a week had missed but one train in the three years that it had been in operation. Impressed with the possibilities of a service which would collect milk at their doors and deliver it in Leeds, the farmers left the meeting to consider the advisability of forming a co-operative society for the purpose of purchasing a van and maintaining it in service.

VANCOUVER BUYS FIRE APPARATUS.

Vancouver, B. C., has placed in service an 85-foot Webb motor aerial hook and ladder truck, built by the Webb Motor Fire Apparatus Company of St. Louis, Mo. The same city has awarded a contract for two 80 horsepower, air-cooled tractors for pulling steam engines, one 50 horsepower, air-cooled chemical engine and one 50 horsepower, air-cooled combination chemical and hose car to the Seagrave Company of Columbus, O.

SAMPSON IN MANITOBA.

The largest motor truck ever used in western Canada was recently put into commission by the Manitoba Government Telephones. It is being used for hauling reels of cable and for doing other heavy work around the city of Winnipeg. The new truck is a five-ton Sampson, built by the Alden Sampson Manufacturing Company, a constituent of the United States Motor Car Company, with headquarters in Detroit. It is equipped with a power winch for hoisting the immense reels of cables onto the platform body.

G. M. C. AGENT IN WINNIPEG.

Negotiations were recently completed by Walter Jackson of Winnipeg, Man., whereby he becomes the western Canada agent for the General Motors Truck Company of Detroit and New York City. This firm manufactures the G. M. C. commercial cars. It is stated that Mr. Jackson may establish a renting business for those firms who need haulage only a part of the year.

MOTOR SERVICE IN VENEZUELA.

The Venezuela government has given to J. M. Alamilla Ramos the exclusive right for 20 years to transport freight and passengers by automobiles or steam motors between San Felix, Upata, Guasipati, El Callao and Turemero. He is to be allowed the present wagon road and must keep it in repair. The ordinary traffic by carts and mule trains is not to be disturbed. The free entry of machinery, tools, fuel, vehicles, etc., which the enterprise will need, is granted by the government. No national taxes are to be imposed, and the enterprise shall also be privileged to use what national

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land it may need for buildings and to cut timber along the right of way for the repair of bridges, etc. The service is to be installed within a year after the approval of this contract by congress. The address of the concessionaire is care of Hotel Klindt, Caracas.

MALAY FREIGHT TRANSPORTATION.

The subject of transporting freight by motor vehicles in the Malay states is being considered by a syndicate. It is the intention at first of placing in commission a five-ton vehicle with a speed of from 10 to 12 miles an hour or lower. It will be put to do the work now being done by bullock carts, and to compete with them. The syndicate in an effort to learn if the work can be done any cheaper in this manner, will experiment with one car first, and if it is found successful, others will be added. The roads in the states are said to be in fairly good condition.

OPENING IN CANADA.

That there is a broad field for the American made motor vehicle in British Columbia and Canada seems the natural conclusion to be drawn from recent orders placed with manufacturers in the United States from Vancouver, Montreal and Toronto for fire fighting apparatus. Residents in these sections in many instances have taken readily to the American pleasure car, but there still appears to be many opportunities, especially in the fruit growing regions of British Columbia and the agricultural districts of the great northwest of Canada. The introduction and application of motor trucks to these sections will readily follow on demonstration of their advantages.

ALBION SENT TO MALAY STATES.

A combination passenger and freight carrying vehicle was recently shipped to the Federated Malay States by the Albion Motor Car Company, Ltd., of Glasgow, Scotland. The chassis is of the maker's 16 horsepower type, and is fitted to a particularly constructed body, designed to carry passengers on the top and ice inside. The truck is the first of several of the same general plan to be operated in public service in the Malay states.

GERMANY PRESENTS OPENING.

The bureau of manufactures at Washington, D. C., has a report from its consul in Germany, in which it is stated that a firm of bankers and general merchants is considering the advisability of resuming an automobile service between two points in Germany, five miles apart. That there would be considerable profit in the undertaking is the belief of the promoters, who are now looking for a suitable car. The vehicle must be of simple construction and must be so geared that it can take a number of severe grades with little difficulty. The high cost of gasoline in that part of the world should be taken into consideration by prospective bidders. Copies of the complete report of the consul, containing other details, can be secured from the bureau by interested manufacturers.

FIRE APPARATUS IN ENGLAND.

A number of English townships are considering the advisability of motorizing their fire departments. Bournemouth has accepted, conditionally, the tender of J. Morris & Sons, Ltd., for a motor fire engine, and application is to be made for sanction to the necessary loan that will cover the cost. The general purposes committee of the Corporation of Durham is considering the purchase of a fire engine while the town council of Lancaster has plans for a similar piece of apparatus. The chief constable of Scarborough has been authorized by the town council to obtain information regarding motor fire engines.

WILL HANDLE WHITE SALES.

Capt. B. K. Bagnall-Wild, well known to the automobile trade in London and other English cities, has been secured to head the commercial vehicle department of the White Company's British branch. The White truck, made by the White Company at Cleveland, O., is gaining a strong foothold in Great Britain, orders having been received recently, those placed by Gamage's and the London & North West Railway being the largest.

NEW NOVA SCOTIA COMPANY.

Organized for the purpose of taking over the Nova Scotia Carriage Company of Kentville, the Nova Scotia Carriage & Motor Car Company of Amherst, was recently capitalized for $2,000,000. A portion of the stock is to be expended in the erection and equipment of a modern plant in Amherst.

BUDAPEST CAB REGULATIONS.

The authorities in Budapest have drawn up regulations regarding the construction and equipment of such electric cabs as may be licensed for use in the capital. The vehicles shall carry four passengers and their baggage throughout the city. The vehicles will be after the landaulet model, fitted with side windows, canopy, space for luggage on the top of the roof, brass mounted fittings at the back, a hood for the reserve wheel, two electric or kerosene head lamps, two reserve acetylene lamps, with reservoir, for extra-urban travel, and a glass windshield.

NEW SOUTH WALES MARKET.

Those familiar with the situation claim that if trade in the beautiful marbles that are quarried in New South Wales is to be developed, it will be necessary to utilize motor trucks for the conveyance of the heavy blocks to the seaboard for shipment or to the centres where the marble is dressed. The matter of transit seems to be the only impediment in the way of a rapid growth of the industry, and a number of companies are giving the subject of motor driven vehicles deep consideration. There is one thing that may stand in the way of the introduction of the heavy trucks and that is the roads or bush tracks.

BRIGHT OUTLOOK IN THE SOUTH.

H. C. Whitney, travelling sales representative of the American Locomotive Company, New York City and Providence, R. I., recently returned from a five months' trip through Georgia, Florida, Louisiana and other southern states, covering 25,000 miles while away. He reports a bright outlook for the motor truck in the territory travelled during the year to come, and declares that the most progressive firms in the South are alert to the possibilities of the industrial transport.

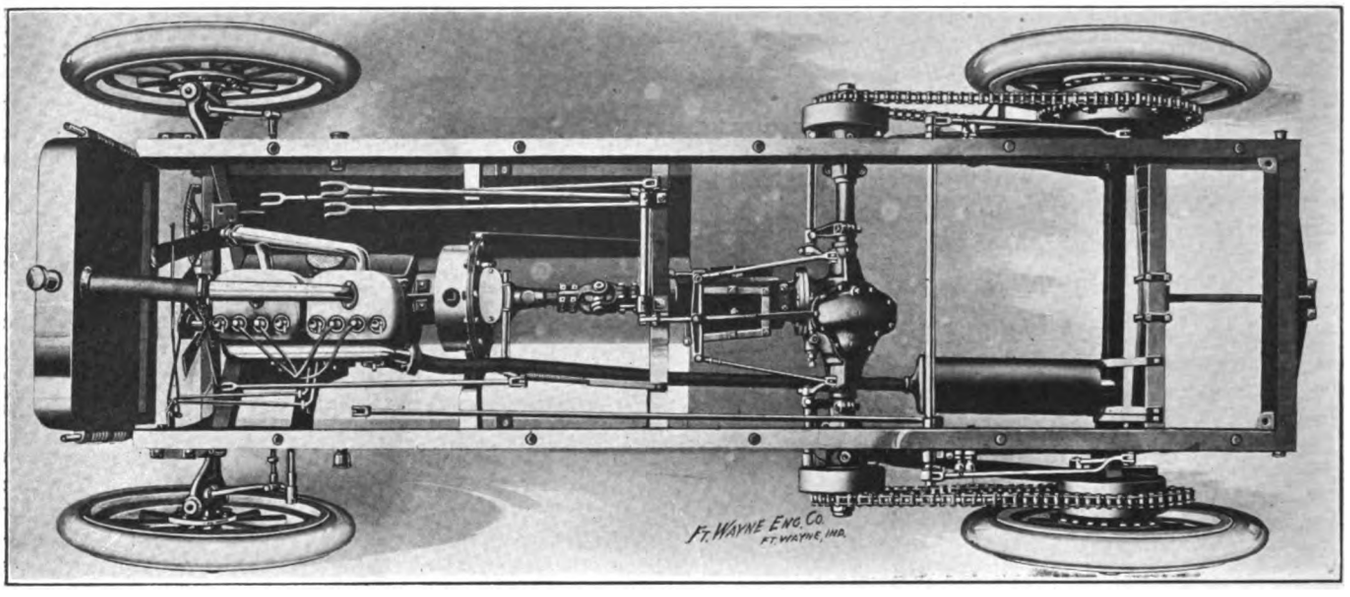
"The work that a five-ton motor truck in Baton Rouge has been doing to relieve the flood situation is known all through the South," says Mr. Whitney. "It has fairly amazed business houses, many of which did not realize before how great an influence motor trucks could exert. This single vehicle has accomplished much for the popularity of the motor vehicle in the South."

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SIMPLICITY AND ACCESSIBILITY OF IDEAL TRUCKS.

SIMPLICITY and accessibility are important factors to be considered in the industrial transport, and these features receive serious attention by those whose business and capital does not warrant the outlay of money involved in maintaining more than one machine. To be operated economically the vehicle should be so designed and constructed that in the event of accident the damaged part may be removed quickly and easily and a new member substituted without unnecessary delay and loss of service from the car.

In designing its product, the Ideal Auto Company, Fort Wayne, Ind., gave the subject of accessibility serious consideration and throughout the chassis has incorporated mechanical features making for simplicity and easy maintenance. Anyone of the three important units of the motor car, the power plant, transmission and jackshaft, are so constructed that one or more may be removed easily without disturbing the other components. This accessibility even includes the radiator which is hinged and spring suspended, a noteworthy feature. Even with the body fitted to the chassis, the components of the latter may be inspected and lubricated readily without undue effort on the part of the operator. The unit construction has also been applied to the seat, this member, including the gear shifting lever, steering mechanism, dash, fuel tank, etc., being detached easily from the chassis by the loosening of a few bolts.



Chassis of Model H Ideal, a Design Making for Simplicity and Accessibility of Components—Any of the Units May Be Removed Without Disturbing Other Parts.

Three Models Produced.

Three models are manufactured by the company, these being known as I, H and G and their carrying capacities are 1500, 2000 and 3000 pounds, respectively. In the matter of chassis construction the models I and H are similar with the exception that certain components of the larger vehicle are strengthened to meet the requirements of larger loads. The G model differs only in the clutch and motor, the latter being rated at 35 horsepower against 24 for the smaller cars.

Both models H and I, illustrated herein, are fitted with a four-cylinder, four-cycle, water-cooled motor having a 3.5-inch bore and 4.5-inch stroke. The cylinders are offset, being cast in pairs with integral water jackets, and these are liberal in size providing ample cooling surface under all conditions of service. A special high grade, close grained gray iron is utilized and in the matter of machining and grinding special care is taken to insure accuracy of measurement. The pistons and rings are also ground accurately to size and carefully fitted, insuring the same relative compression on each cylinder and a well balanced motor.

A three bearing crankshaft is employed, this member being of a high grade, specially heated steel and ground to size. This revolves in bearings of ample size and as these bearings are carefully adjusted, it is claimed they will operate thousands of miles without any other attention than lubrication. The same high grade of material and workmanship is noted in the construction of the connecting rods and wristpins and their method of retention.

Components of Power Plants.

The mechanically operated and interchangeable valves, both intake and exhaust, are located on the left hand side of the motor, which is noticeable for its compact design and smooth lines. The valves are of liberal size and these are actuated by a single camshaft the cams of which are well designed, insuring quiet operation. A feature of the valve mechanism is that of enclosing the springs, guides and stems in a demountable housing, protecting the members from foreign elements as well as making for quietness. This housing may be removed easily by loosening a locking screw.

Both the intake and exhaust manifold are retained by stirrups mounted upon studs and the intake member is of the T type, the mixture passing unobstructed through an opening in each cylinder to the combustion chamber. The exhaust manifold is liberal in size, insuring a free egress of the burnt gases and reducing back pressure to a minimum.

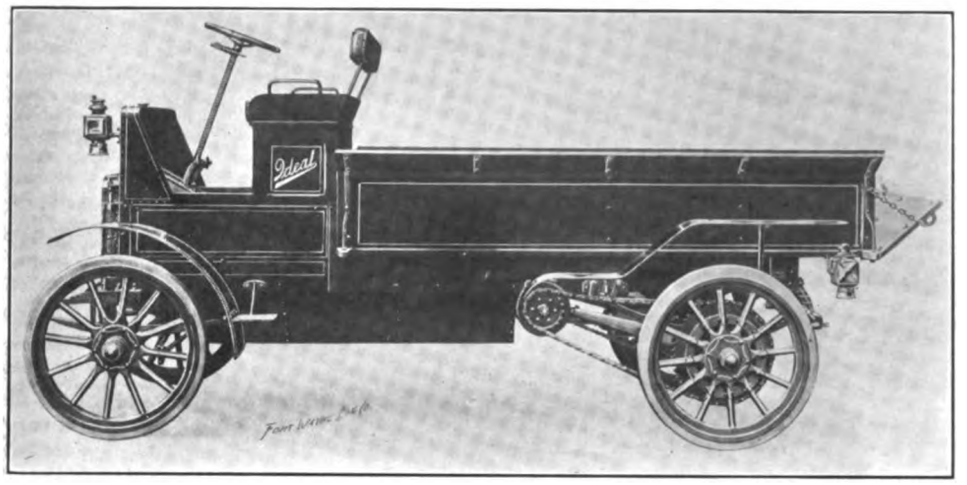
Both the carburetor and magneto are located on the left hand side of the motor leaving the right of the engine remarkably free from obstructions. Ignition is by a true high-tension magneto, although option of a double ignition system and storage battery is listed as extra. The oiling system is a self-contained, constant level force feed and splash, the lubricant being circulated by a gear driven pump located on the left hand side of the motor. Provision also is made for two leads from the oil container to the camshaft bearings.

Novel Radiator Design.

Cooling is by the thermo-syphon system assisted by a belt driven fan. Cooled fluid is taken from the bottom

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of the radiator and led to a manifold on the right of the motor and after circulating through the water jackets, flows out through another manifold on the top of the cylinders and thence to the radiator. A feature of the latter, which is equipped with vertical tubes, is its suspension. It is mounted on hinges which permit the cooler to be swung outward when desired. A balanced spring suspension absorbs all road shocks and vibration. As will be noted in an accompanying illustration, both the water manifolds and pipes attached to the cooler are equipped with flanges, these being held together when the radiator is in position by retaining bolts. These flanges are carefully machined and the use of gaskets or shellac is dispensed with as the members are absolutely water tight when properly connected. The flanges may be separated quickly and the radiator swung out or the cooler removed when an inspection of the power is desired.



Ideal One-Ton Vehicle, Depicting Location of Driver and Controlling Levers at Right.

Construction of Clutch.

The clutch utilized is patented, and is of the expanding wedge type. It is pointed out by the maker that it is free from binding or biting and operating as it does in a constant bath of oil is very easy in its engagement yet is free from slipping. The accessibility of this member is in keeping with the design of other components. By utilizing a substantial double universal joint at the rear of the clutch, the latter and its housing may be removed quickly, the operation involving but the loosening of four retaining bolts. The company maintains that as the clutch operates in oil it is not susceptible to wear, all parts revolving with the flywheel whether the clutch is in or not.

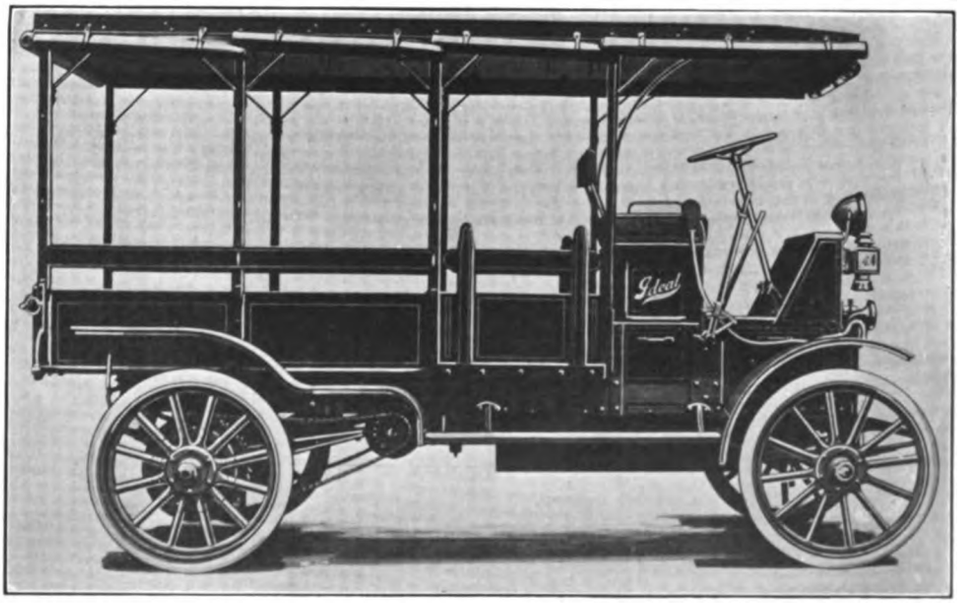
The transmission is immediately forward of the jackshaft and is secured to the housing of the latter by a webbed casing, insuring alignment and rigidity. The sliding gear transmission provides three speeds forward and reverse and all gears are of a high grade nickel steel, having wide face. The shafts and bearings are ample in size and operate in a bath of lubricant, insuring quiet operation. A straight line drive from the crankshaft is a feature of the design, insuring a minimum loss of power. The clutch housing and transmission are suspended by cross members, these being securely anchored to the main frame.

Final drive is by side chains to the rear wheels. The rear sprockets are bolted to the wheel drum proper, being conducive to accessibility. The frame is of angle steel with white ash sills, two by five inches, bolted on, a construction making for flexibility when traversing rough roads. All cross members are of crucible cast and angle steel and the corners of the frame are well braced and hot riveted.

Both the front and rear axles are square, being drop forged. The front axle is 1.5 by two inches, while the rear is two inches square on the model I. Those on model H are 1.625 by 2.25 inches front, and 2.125-inch rear. Ball bearings are employed in the wheel hubs and steering knuckles. Particular attention has been paid to the construction of the yokes, these being drop forged and of liberal size. Those on the smaller model are seven inches deep, while the model H is equipped with members nine inches deep.

The springs are secured to the axles by substantial clips, three-quarter elliptic being employed in front and three-quarter platform in the rear. An auxiliary cross spring is utilized when carrying heavy loads. The wheels are of the artillery type and 12 spokes are employed on both models. Model I is equipped with 1.75-inch spokes in front and two-inch at rear. Model H utilizes two-inch spokes in front and 2.25 in rear.

Solid tires are fitted as standard equipment on models H and I, although pneumatics may be had, these being extra. On the smaller vehicle the front tires are single, 36 by 2.5 inches front, and 36 by three rear. Model H is equipped with single tires, both front and rear, the former being 36 by 2.5 inches and the rear 36 by four. The wheelbase is 109 inches for model I and 115 for H, the tread being 56 and 58 inches, respectively. A short turning radius is a feature, it being claimed that either machine may be turned in 20 feet.

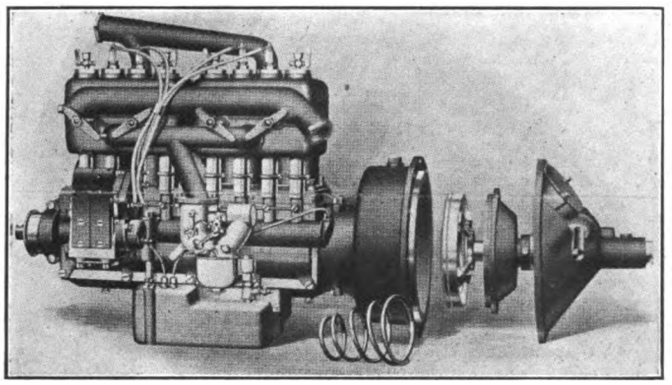


Model I, 1500 Pounds Capacity Ideal Truck, Equipped with Standard Type of Express Body.

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Ample Sized Brakes.

Unusual attention has been paid to the matter of brakes, an important factor in the operation of the industrial transport. Two sets are provided, the service members being on hubs of the jackshaft. These are of the internal expanding type operated by pedal and their friction action is balanced by an equalizer mounted just front of the transmission. These brakes are 10 inches in diameter with two-inch face. The emergency members are also of the internal expanding type operating in the drums of the rear wheels and actuated by a hand lever convenient to the driver. These are 10 inches in diameter and have a two-inch face. The total braking surface provided by these two sets is 270 square inches. Well designed radius rods make alignment of the rear axle an easy matter.



The Motor and Clutch of the Ideal Truck Are Compactly Arranged and Readily Accessible.

The steering gear is of the gear and sector type being connected to the road wheels by a horizontal reach rod. The adjustable tie rod is located behind the front axle protecting it from possible damage by road obstructions. The spark and throttle levers are mounted upon the steering column and the latter is fitted with a 16-inch wheel. The gear of the steering mechanism is secured to the front cross member of the frame. The worm attached to the end of the column is in mesh with the gear when the seat unit is in place, but these components are easily separated when the unit is removed.

Removable Seat Unit.

The seat unit and motor housing may be taken from the chassis by loosening two bolts. It is constructed of steel and the side panels for inspection purposes are also of this metal. Additional means for inspection are provided by the floorboards while a removable member in floor of body permits access to the transmission.

In the matter of construction, the company has considered the comfort of the driver, a removable spring seat being fitted with a leather covered "lazy back." The upholstering is deep and a high grade of leather is employed throughout. The standard equipment includes three oil lamps, horn, tool kit, tool box, fenders and running boards. The weight of the chassis, which includes seat, is 2800 pounds for model I, and 3350 with express body. The model H chassis weighs 3000 pounds, and 600 extra with standard body.

Although the company manufactures a large variety of bodies to suit the individual requirements of the customer its standard bodies are interchangeable and are eight feet by 44 inches, and eight feet six by 58 inches for model I. The bodies of the 2000-pound vehicles are made standard in the following sizes: Eight feet six inches by 44 inches inside, and nine feet by 58 inches. The standard color is cobalt blue for body and chassis, although this is optional.

Details of Model G.

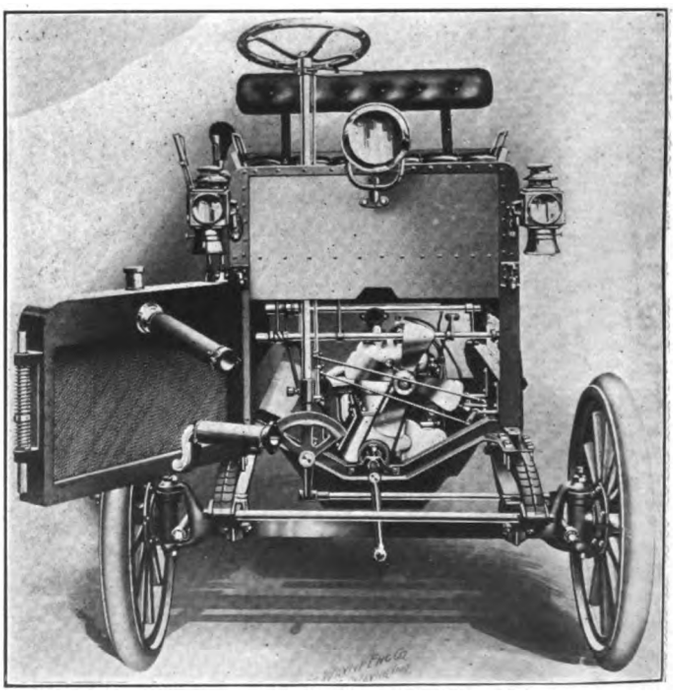
The model G differs from the smaller vehicles inasmuch as the motor is cast en bloc and is rated at 35 horsepower, although it is stated it will develop 42 at 1500 revolutions a minute. Cooling is by a centrifugal pump and a double ignition system, consisting of magneto and battery with coil, is utilized. The clutch is cone in place of the wedge type utilized on the smaller models. Demountable solid tires are employed both in front and rear, the front members being 36 by four inches, and the rear 36 by five. The wheelbase is 124 inches, and tread 60.

The other components of the chassis are identical with those of the smaller models with the exception that parts are strengthened as necessary to take care of heavier loads. The chassis weighs 3800 pounds, and with platform body 4500. The inside dimensions of the standard size bodies are 10 feet, 58 inches and 11 feet, 64 inches.

Throughout the construction of the Ideal vehicles careful attention has been paid to small details which, with the simplicity and accessibility of design, make for a sturdy truck for heavy duty service. Although the rated capacities are given, the Ideal Auto Wagon Company states its load rating is conservative.

NEW KNOX PATROL.

The motor police patrol, built by the Knox Automobile Company of Springfield, Mass., soon to be placed in commission in Manchester, N. H., will be the largest and most completely equipped in all its details of any in the country, according to the specifications of the manufacturer. The new machine, which will be of 70 horsepower, will be delivered in about 60 days. It will be utilized as a combined patrol and ambulance. Two double stretchers will be carried and in addition the seats are arranged with a rail that can be lifted, preventing a person rolling from the cushions, making, in fact, a stretcher of each of these. The machine will be lighted throughout by electricity, the Berdon system being used. The current will be furnished by a dynamo run by the engine, and in addition to the front and rear lights, there will be two dome lights inside.



Front View of Ideal Truck, Showing Hinged Radiator and Removable Seat Unit.

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MOTOR TRUCK CLUB MEETING.

Plans for expansion were considered at the last meeting of the New York Motor Truck Club, which has grown from a somewhat vague organization to one of decided usefulness in the commercial vehicle field. Aiming, originally, at promoting a few shows for trucks, the organization has found for itself a place in the industry as a nucleus for all kinds of industrial transport interest and as a medium for the exchange of opinion among makers, buyers and sellers, for the common information of all. To provide for greater usefulness, it was voted to enlarge the membership so as to include three classes—active, comprising those actively engaged in the industry; associate, comprising owners and some classes of operators, garagement, etc., and honorary, including the press and such others as the club may from time to time add to the list. The privilege of all information and of the floor at all meetings will be open to all classes, but the voting power rests with the active members only.

A sharp attack was made on demonstrating, or the evils of it. It was claimed that the custom of free demonstration had been abused, not only in New York City, but all over the country. It was pointed out that rival manufacturers have been systematically "used" by big merchants, with vague, if any prospect of buying, and to such an extent in New York City, that many of the latter have been placed on the "black list." Charles E. Stone, secretary of the club, gave a paper on this phase of the situation, in which he stated:

"Demonstration according to the dictionary is a showing or pointing out; an indication, manifestation or exhibition. According to the truck salesman, it is something necessary to do in order to make up for his own lack of ability or experience. According to the prospective purchaser it appears to be an easy method of securing free delivery of merchandise without incurring any expense or trouble. According to the expert accountant it is one of the greatest sources of loss connected with the sales of trucks."

Mr. Stone pointed out that the truck salesman must necessarily employ different means than the man handling the pleasure car, a fact he believed had not been fully realized to date. Furthermore, he maintained that a man who had been a success as a pleasure car salesman, might be a complete failure in handling the sales of trucks. In closing his paper, he said:

"We are inconsistent in another very vital particular, namely, the personal appearance of our salesmen. Our human sales force goes forth well dressed, but the silent salesman, the truck, often barely has enough paint left on it to cover half the metal, with a body much the worse for wear, and perhaps festooned with coils of old rope and string. When it comes chugging and snorting up to the door of the intended purchaser, is it any wonder that he is loath to go anywhere near the thing? If it is thought desirable for salesmen to dress well, why not our demonstrating trucks, in keeping with the standing and reputation of the companies behind them?"

NEW LIPPARD-STEWART COMBINE.

T. R. Lippard and R. G. Stewart, organizers of the Lippard-Stewart Motor Car Company, Buffalo, N. Y., have resigned from that organization and have formed the Stewart Motor Corporation, with headquarters in Buffalo. Mr. Lippard is president and general manager and Mr. Stewart vice president and chief engineer of the new concern. R. P. Lentz is secretary and treasurer, and Robert W. Ingersoll, formerly with the Lippard-Stewart company, is sales manager. The capitalization of the new company is $250,000 and temporary offices have been established at 1056 Ellicott Square building.

It is stated that the founders of the Lippard-Stewart company withdrew because of business differences with other members of the firm. The older company will continue to operate the factory in Elmwood avenue, Buffalo. August Becker, who has been president of the company since Aug. 15, 1911, and Mr. Barcalo, who has been secretary and treasurer since the same date, are now in full control of the company. Charles H. Dahlquist, who was factory engineer, has been made chief engineer in place of Mr. Stewart. W. F. Reynolds is the sales and advertising manager.

The older company will continue to manufacture light delivery cars of 1500 pounds capacity, and will also, in the very near future, manufacture and sell a one-ton delivery truck. The new corporation will produce light trucks of 1500 pounds capacity, constructed along the lines of the one made by the firm with which its members were previously connected.

MORGAN REPLACES TROLLEYS.

A five-ton Morgan truck, made by the Morgan Motor Truck Company, Worcester, Mass., was recently sent to Portsmouth, N. H., where it will be used in place of a trolley line between that city, Kittery, Me., and other points of interest in the vicinity. The automobile has seats placed sideways, and can accommodate about 30 passengers. It was built with a special body, similar to that of a trolley car, with top and side posts. The entrance is by a running board in the rear, on which the conductor is to stand to take fares as the passengers enter. In case the machine is found satisfactory, others of similar construction will be bought.

MOTOR CARS FOR TRACK WALKERS.

The Boston & Albany division of the New York Central Railroad, is contemplating, it is said, purchasing 10 motor cars for railroad tracks, to take the place of track walkers, and handcars for sectional gangs, which the officials have considered dangerous for up-to-date railroad traffic. The cars are to be similar to those propelled by hand, save they will have four flanged wheels, and will be equipped with a two or three-cylinder type of motor. The plan is for about 20 horsepower, with two forward speeds and reverse transmission.

EXPRESS COMPANY HAS WESTFIELD.

The Seymour Motor Express Company was recently incorporated in Connecticut. The firm has purchased a two-ton Westfield truck, made by the Westfield Motor Truck Company, Westfield, Mass., and will conduct a delivery business between Seymour and New Haven by the way of Woodbridge. Dudley H. Riggs, formerly of the Auto Express Company, will be the manager. The truck will later be equipped with seats so that it can be used in passenger carrying service also.

RAILROAD SECURES MOTORS.

The Pennsylvania railroad will displace its heavy horses and drays at its shops in Harrisburg, Penn., with motor trucks. A large number of teams has been utilized to do the carting about the shops in the past, but these will be entirely replaced. A garage for the storage of the automobiles will be built on the company's property at Seventh and Reily streets.

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TRANSCONTINENTAL DELIVERY BY ALCO.

THE first transcontinental delivery of merchandise ever attempted in the commercial vehicle industry began in Philadelphia, June 20, when Charles W. Young & Co., of that city consigned a three-ton load to an Alco truck, made by the American Locomotive Company, New York City and Providence, R. I., for delivery to the Carson Currier Company in Petaluma, Cal. The estimated distance to be covered in this experiment is 4436 miles. The ultimate success or failure will be awaited with interest.

It may be held that as a commercial proposition the delivery of goods across the continent by motor transport will never be practical. However, that is a point which may be open to question. A few years ago it would have been considered that cross country motor haulage could not be made economically and efficiently. Conditions have changed materially. The present transcontinental delivery may prove the forerunner of a new era.

At least, it will demonstrate the utility of the particular vehicle selected for the test. In addition, there is much to be learned concerning the equipment of the car, and particularly in the matter of tires. This Alco is shod with new United States demountable solid tires, made by the United States Tire Company, New York City, and the outcome of the trip will be watched with quite as much interest by those intent upon studying the tire problem.



Three-Ton Alco Leaving Philadelphia on the First Transcontinental Delivery Trip.

The start from Philadelphia was decidedly in keeping with the magnitude of the undertaking. Assembled at the Point Breeze race track, several local business men took part in the programme. Letters of greeting from Gov. John K. Tener of Pennsylvania to Gov. Hiram W. Johnson of California, were a part of the cargo. E. L. Ferguson, an official in all the Glidden tours and in many transcontinental trips, is in charge of the expedition.

THIRD ORDER FOR G. V. TRUCK.

The Brown & Sharpe Manufacturing Company, Boston, Mass., recently placed its second repeat order for an electric motor truck with Day Baker, New England manager for the General Vehicle Company, Long Island City, N. Y. The purchaser bought its first machine somewhat over a year ago, soon following it with an order for another. The third truck of the same make will be placed in commission soon. Mr. Baker points to these orders as strong evidence of the satisfactory operation of G. V. electric machines.

GROCER BUYS MARTIN TRUCK.

The Bayer-Beaver Company, wholesale grocer in Huntingdon, Penn., recently added a Martin three-ton 45 horsepower, four-cylinder truck, made by the Martin Carriage Works, York, Penn., to its delivery equipment. The machine attracted unusual attention as it is the largest of its kind in the vicinity. The grocery concern plans eventually to entirely do away with its horse drawn vehicles.

PIERCE-ARROW DELIVERS LUMBER.

The time of loading and unloading a Pierce-Arrow five-ton truck, made by the Pierce-Arrow Motor Car Company, Buffalo, N. Y., has been reduced to a minimum by the Capitol City Lumber Company of Front street, Hartford, Conn. The time required for both operations is five minutes or less, five to six tons of lumber being handled to a load. This means over 5000 feet of lumber, double and nearly triple the amount that could be hauled by a pair of work horses.

The truck was designed by the Miner Garage Company of Hartford, the regular Pierce-Arrow chassis being employed, but an extra long wheelbase has been provided. The body is equipped with a series of rollers which permit the whole load to be dumped in one minute. To load takes a trifle over three minutes. At the yard, the lumber to be delivered by the truck is assembled on a large wagon, termed a "feeding wagon," and a system of rollers has been devised, whereby the lumber can be moved quickly from the "feeder" to the larger vehicles.

This method is one which has been tried with decided success by many lumber concerns throughout the country. It has the advantage of permitting the greatest possible efficiency from the motor vehicle with consequent economy.

AUTOCAR REPLACES EIGHT HORSES.

Albert Hansell, one of the best known fruit growers and produce raisers in Burlington county, New Jersey, recently purchased a motor truck, made by the Autocar Company, Ardmore, Penn., and it has proved such a saving over his horse drawn wagons that he says he does not know how he ever did business without it. The truck is used in delivering fruit in Philadelphia. Mr. Hansell says his Autocar does the work of eight horses. It takes a team of good horses 10 hours to haul a load of produce to Philadelphia and return to the Hansell farm, a total distance of 34 miles. The Autocar accomplishes this same journey in 3:15:00. In other words, the car can deliver four loads to a Dock street commission merchant while a team of horses is delivering one.

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BRIEF NEWS OF MANUFACTURER AND THE TRADE

The Braender Rubber & Tire Company, Wallington, N. J., has incorporated with $250,000 capital stock, to manufacture rubber tires and specialties.

The Mogul Motor Truck Company, Plano, Ill., has increased its capital stock from $125,000 to $500,000 so that it may enlarge its manufacturing equipment.

The C. R. Wilson Body Company, Detroit, has closed bids for a $45,000 factory building. The new plant will be three stories in height, 171 by 101 feet, and will be of brick and steel construction.

The Eadie Vehicle & Gear Company was organized recently in Buffalo, N. Y., to manufacture motor trucks. The company has a capitalization of $200,000, and it plans to build a factory in Buffalo.

The Punctureless Tire Company was recently incorporated in Louisville, Ky., for $5000, divided into shares of $100 each. The incorporators are Andrew T. Murphy, John H. O'Neil and H. John Hobson.

The Enterprise Motor Truck Company was incorporated recently in Baltimore, Md., for the purpose of manufacturing commercial vehicles. The members of the concern are Gustave H. Nachman, J. Harry West and J. Walbach Edelen.

and garage is to be erected, and the branch will be conducted by Henry Bonde, under the title of the Bonde Auto Company. Mr. Bonde was formerly employed in the Warren plant.

Cheatham Bros, Atlanta, Ga., is to take the agency for the Velie pleasure and commercial cars, made by the Velie Motor Vehicle Company, Moline, Ill. A garage of brick, to cost approximately $5000, is being erected at 453 Peach street.

The Standard Engineering Company was formed recently in Belfast, Me., by Austin W. Keating and Maurice W. Lord. The company, which is capitalized for $10,000, will do a general sales business in automobiles, accessories and equipment.

The Delphie Specialty Manufacturing Company, Detroit, has been incorporated with $20,000 capital stock to manufacture automobile parts and accessories and to do general machine work. Peter J. Wesolowski is the principal stockholder.

The Citizens' Motor Car Company of Cincinnati, O., recently leased three rooms in the new Seely building in that city. The company is agent for the Packard pleasure and commercial vehicles, made by the Packard Motor Car Company, Detroit.

A White Agency was recently opened in Nashville, Tenn., by Elbert S. Craig and L. E. Gibson. They will handle both



Part of the Fleet of 46 Alco Trucks in Service with the American Express Company, New York City.

The Drake Railway Auto Truck Company is one of the newest corporations in New York City. It has a capitalization of $250,000, and the incorporators are F. E. Drake, A. Bauer and H. B. Tibbetts.

The Jolls Motor Truck Company, Detroit, has been incorporated with $20,000 capital stock to manufacture automobile trucks. The incorporators are Leroy E. Jolls, George Hornberger and Sidney I. Harry.

The Van Guard Manufacturing Company, maker of windshields for automobiles, with headquarters in Detroit, is preparing plans for two large additions to its plant, one 90 by 200 feet and the other 60 by 100 feet.

The Non-Destructible Tire Company has been incorporated in Brooklyn, N. Y., with a capital stock of $25,000. The incorporators are Martin Pelz, William Weiner, Herman Seufert, William Texfer and Richard Weber.

The Willard Storage Battery Company is having an addition built to its plant in Cleveland, O., which, when completed, will give a total of 25,000 feet of floor space. New offices were taken recently at 5716 Euclid avenue, Cleveland.

The Warren Motor Car Company, Detroit, Mich., maker of the Warren-Detroit pleasure cars and light delivery wagons, has established a state branch in Fargo, N. D. A salesroom

the pleasure and commercial vehicles made by the White Company in Cleveland, O., and will also conduct a general garage.

The Eastern Motor & Conveyance Company is planning for the erection of a public garage at Fayette street and Philadelphia avenue, East Baltimore, Md. Plans call for a one-story building of brick and reinforced concrete, 50 by 122 feet.

The Commercial Service Truck Company, Grand Rapids, Mich., has been organized, with a capital of $175,000, by Philip Moran, J. W. Laudman, G. H. Greenbauer and others. The new company is a reorganization of the Van-L Truck Company.

The American Express Company, New York City, now operates a fleet of 46 Alco trucks, made by the American Locomotive Company, New York and Providence, R. I., a portion of which is shown in an accompanying illustration. The 10th order has only recently been placed, specifying five 3.5-ton vehicles.

The National Body Comfort Company has been formed in Windsor, Ont., with a capital of $100,000. The company will manufacture bodies for both pleasure and commercial motor vehicles. A $35,000 building is in the course of erection.

Frank Hardart is having a large garage built at 2126-28 Market street, Philadelphia. The structure will be two stories in height, of brick, and will cost approximately $40,000. Mr. Hardart will conduct a salesroom and a service station.

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John A. Graham, at one time superintendent of assembling and testing at the Brightwood Motor & Manufacturing Company, Springfield, Mass., has been appointed engineer and superintendent of the Westfield Motor Truck Company, Westfield, Mass.

The Henry Engineering Company was incorporated in New York City recently for $20,000, to design and manufacture parts for motors, automobiles, etc. The members of the concern are: George L. Henry, Henry W. Badenhausen and Myron F. Hill.

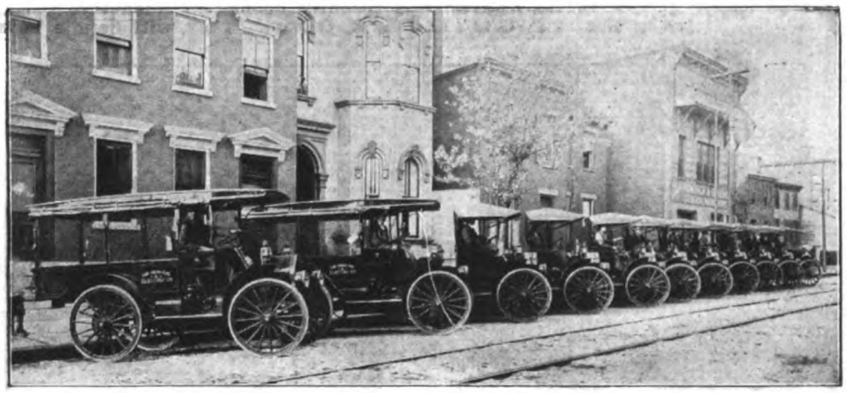
The Randolph Motor Truck Company has been incorporated under the laws of Delaware with a capital stock of $100,000. The concern, in which considerable Chicago capital is interested, is to manufacture motor trucks in some Delaware city not yet decided upon.

The North Jersey Auto Supply Company has been formed in Jersey City, N. J., to do a general automobile business. The capital stock is $80,000, Jersey City and Newark men being interested in the concern. The directors are E. C. Mohrof, C. G. Butler, F. W. Mead.

The Panama Manufacturing Company has been formed in Malvern, Ark., for the purpose of making motor trucks. S. F. Sherman of Chattanooga, Tenn., is the president of the new concern, and it is said considerable Tennessee capital is interested in the project.

The Dennis Motor Company, with headquarters in Toledo, O., has been formed for the purpose of dealing in automobiles, motor parts and automobile accessories. C. H. Dennis, C. W. Close, Allen E. Reid, R. S. Woodrow and John H. Meister are the stockholders. The concern has a capitalization of $25,000.

The Lawrence Auto Company, New Castle, Penn., was recently purchased outright by the John Electric Company of the same city. Leo Collier, who was with the Lawrence people, has gone to Youngstown, O., where he plans to conduct a general automobile garage.



Fleet of 11 International Auto-Wagons Recently Purchased by Large Concern in Cincinnati, O.

The Detroiter-Baltimore Company, Baltimore, Md., has been formed for the purpose of manufacturing automobiles and motor trucks. The officers of the concern are: R. H. Croxton, G. A. Jarman, J. Oscar Stermer, Clara L. Croxton and Howard F. Smith, all of Baltimore.

The Hexolene Lubricating Company, Inc., was organized recently in New York City for the purpose of manufacturing lubricants for automobiles and other machinery. The capital is $6250 and the incorporators are: Fred Lesser, Norman Ehrenthal and Herman Block.

The Beckwith Trucking Company was formed in Penn Yan, N. Y., recently for the purpose of doing a general business in automobiles and automobile supplies. The capitalization of the concern is $10,000, and the incorporators are H. Allen Wagner, Jay Beckwith and Grace E. Beckwith.

A. Bolognesi & Co., bankers, New York City, have had a one-story concrete and brick factory erected in Poughkeepsie, N. Y., near the works of the Fiat Motor Car Company, where electric lighting outfits for automobiles will be manufactured. The new concern will be known as the A. B. Manufacturing Company.

The Guide Motor Lamp Manufacturing Company, Cleveland, O., has incorporated with a capitalization of $100,000. The incorporators are H. J. Monson, W. F. Pearsons, W. H. Bunce, J. D. Kauffmann and W. L. Rose. The company will manufacture lamps and other equipment for automobiles.

The United States Light & Heating Company, Niagara Falls, N. Y., is erecting an addition to its present factory buildings 56 by 320 feet, three stories in height of reinforced concrete, to give room for the manufacture of automobile starting devices. Building additions are also being made to the storage battery department. The total number of buildings in the course of erection will double the floor space of the plant.

Hassett & Rogers, Inc., was formed in Amesbury, Mass., a short time ago with a capital stock of $18,000 to manufacture automobile bodies for commercial and pleasure vehicles. The members of the concern are James H. Hassett, Charles H. Prescott and George E. Collins, all of Amesbury.

The Pitt Motor Truck Company has been formed in Pittsburg, Penn., to manufacture motor trucks and a line of pleasure vehicles. The officers of the concern are J. E. Douglass, E. P. Douglass, W. S. Wilson, F. O. Brandt and J. E. McCalmont, all of Pittsburg. The capitalization is $200,000.

The Apple Electric Company has been incorporated for $300,000 in Dayton, O., and will manufacture and deal in electrical ignition and starting systems for motor cars and all kinds of gasoline engines. The incorporators are: V. G. Apple, Oscar Apple, J. C. Slager, Clarence Keifer and Carl Bauman.

The Aristos Company, with a capitalization of $1000, was recently formed in Boston, Mass. The directors and officers are: Treasurer, C. D. Knapp; A. Leslie Harwood, Jr., and Thomas D. Luce, Jr. The company was formed to sell automobiles of both pleasure and commercial types on commission.

The New York Lubricating Oil Company, sole proprietor and refiner of Monogram oils and greases, has taken new quarters for its Pacific Coast branch at 516 Second street, San Francisco, Cal. The new location is a four-story building fitted with the most modern appliances for the storage and handling of lubricating oils.

The Automatic Starter Company was incorporated recently in St. Louis, Mo., with a capital stock of $50,000. The concern will manufacture a self-starter, invented by John J. Cochran, and it is planned to build a factory in St. Louis.

Duquesne Motor Car Company is to be formed in Pittsburg, Penn., application having been made for a charter of incorporation by W. L. Rodgers, F. W. Newton and R. F. Ramsey. The new concern is to be formed for the purpose of manufacturing pleasure and commercial motor vehicles and accessories.

The East End Auto Company recently made extensive improvements in its premises at 13th and Walnut streets, Harrisburg, Penn. Its garage was enlarged and a modern repair shop and elevator installed. The company took the agency for the Atterbury truck, made by the Atterbury Motor Car Company, Buffalo, N. Y., a short time ago.

The Taylor Motor Car Company occupies a three-story building at 7125-31 Kelly street, Pittsburg, Penn., where it conducts salesrooms, a repair shop, stock room and a paint shop. The company is having exceptionally good success with the Lippard-Stewart commercial cars, made by the Lippard-Stewart Motor Car Company, Buffalo, N. Y.

Collins & Dassonville, formerly of Brewster's, New York City, one of the largest coach factories in the United States, after looking the situation on the Pacific Coast over thoroughly, has decided to locate in Bakersfield, Cal., and will open a first class automobile painting and finishing shop. The equipment will include a dust proof finishing room, and apparatus for enamelling, brass burnishing and polishing.

H. K. Annin, until recently engaged in commercial engineering work with the engineering department of the National Electric Lamp Association, Cleveland, O., has resigned to assume management of the Elux miniature lamp works of the General Electric Company, New York City. Mr. Annin is well known in the miniature lamp trade, especially to the buyers of automobile lamps.

The Goodyear Tire & Rubber Company, Akron, O., is contemplating the erection of a large fireproof building near the junction of Commonwealth avenue, Beacon street and Brookline avenue, Boston, Mass., to be used as a receiving and distributing warehouse, in addition to its present building in Boylston street. The new structure is necessary to accommodate the increasing business of the Boston branch.

The International Harvester Company, Chicago, has been selling International Auto-Wagons in fleets during the past few weeks. An accompanying illustration presents 11 of these machines sold to a large concern in Cincinnati, and another public service company in that city also has replaced its horses with 11 Internationals. A Chicago house operates 21 under similar conditions.

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PHILADELPHIA'S SECOND ANNUAL PARADE.

FIVE divisions were necessary to accommodate the commercial vehicles which took part in the Philadelphia Inquirer's second annual motor truck parade in Philadelphia, June 20. Five hundred and nine cars occupied more than an hour in passing a given point. In many respects it was the most successful demonstration of this character that has been held either in this country or abroad.

The first division was limited to cars of over 7000 pounds capacity, and was headed by a large Waverley electric, carrying the committee and Chief Marshal Archie Hughes. The marshal of the division was H. P. Childs of the International Motor Company, assisted by W. C. Middleton of the Foss-Hughes Company and Joseph Smith. Conspicuous among the entries was the Franklin Sugar Refinery Company's 13,000-pound Mack truck carrying 15,000 pounds of sugar; John Rapp, Inc., & Co.'s 10,000-pound Saurer; two G. M. C. 10,000-pound wagons; five Pierce-Arrows of the same capacity; two KisselKars of 8000 pounds capacity each, and Charles W. Young & Co.'s transcontinental Alco.

L. J. Eastman of the Eastman Sales Company was marshal of the second division, with W. Eldridge of the Eldridge Company, and W. O. Rainsford of the Packard Motor Car Company, as his assistants. In this division were trucks of from 4000 to 6900 pounds capacity. Six Alcos led the procession, followed by five Durable Daytons. Among the other makes represented were: Baker electric, Chase, Garford, G. M. C., KisselKar, Grabowsky, Gramm, Kelly, Mack, Morgan, Seitz, Philadelphia, Studebaker electric, Thomas, Packard, Rowe, Wilcox and White.

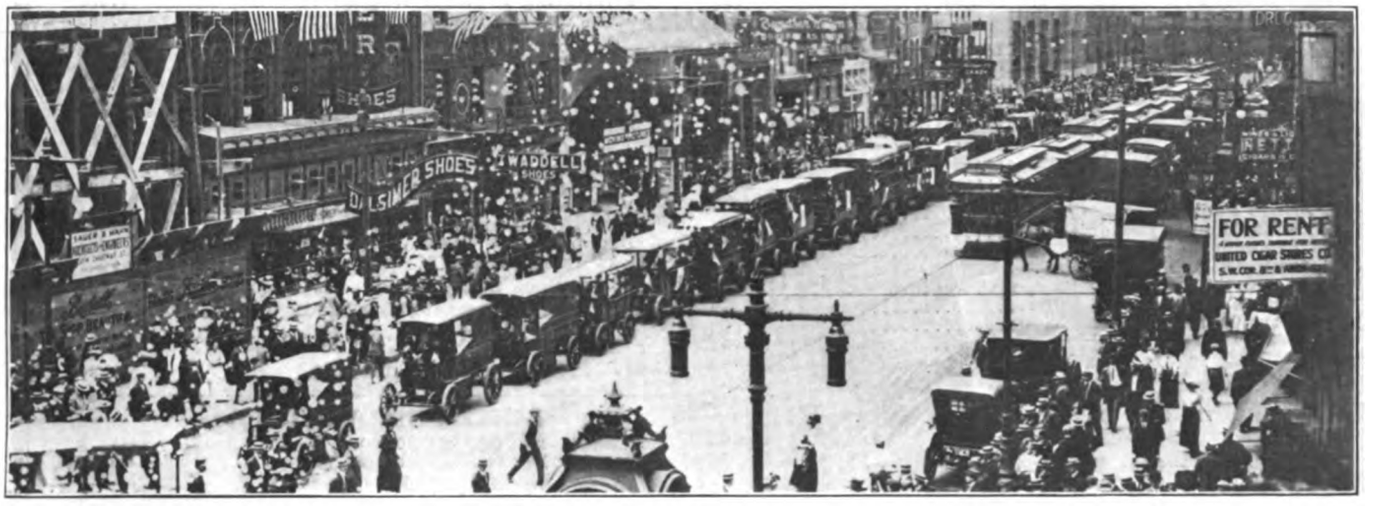
The third division was confined to cars of 2100-3000 pounds. W. W. White of the General Vehicle Company was marshal, assisted by N. W. Busby of the N. W. Busby Company and David O. Eaton of the Autocar Company. Among the makes represented were the following: Autocar, Decatur Hoosier Limited, Garford, Mack, Sandusky, Stanley steam, Wilcox, Hart-Kraft, G. M. C. and Mais.

The fourth division was composed of light delivery vehicles of less than 2000 pounds, including the following makes: Atterbury, Cadillac, Cartercar, Croxton, Denniston, Detroit electric, Ford, Flanders, Gramm, Hatfield, Little Giant, Martin, Service, Studebaker electric, Wilcox and White.

The last division was limited to electrical vehicles, and was in charge of E. M. Hare of the Commercial Truck Company of America as marshal. The following makes were among those represented: G. V., G. M. C., Philadelphia, Woods, Detroit, Waverley, Studebaker, Baker, Walker and Columbus.

The entry list included the product of the following makers:

Autocar Company, Ardmore, Penn., Autocar, 79; Packard Motor Car Company, Detroit, Packard, 47; International Motor Company, New York City, Mack, 38; Commercial Truck Company of America, Philadelphia, Commercial, 29; White Company, Cleveland, O., White, 29; General Motors Truck Company, Detroit, G. M. C., 21; Gramm Motor Truck Company, Lima, O., Gramm, 19; Ford Motor Company, Detroit, Ford, 18; Garford Company, Elyria, O., Garford, 17; American Locomotive Company, Providence, R. I., Alco, 16; H. E. Wilcox Motor Car Company, Minneapolis, Minn., Wilcox, 16; Hart-Kraft Motor Company, York, Penn., Hart-Kraft, 10; Cartercar Company, Pontiac, Mich., Cartercar, nine; Kelly Motor Truck Company, Springfield, O., Kelly, nine; General Vehicle Company, Long Island City, N. Y., G. V. electric, eight; Chase Motor Truck Company, Syracuse, N. Y., Chase, seven; Dayton Auto Truck Company, Dayton, O., Durable Dayton, seven; Peerless Motor Car Company, Cleveland, O., Peerless, seven; Studebaker Corporation, South Bend, Ind., Studebaker electric, seven; Anderson Electric Car Company, Detroit, Detroit electric, six; Kissel Motor Car Company, Hartford, Wis., KisselKar, six; Chicago Pneumatic Tool Company, Chicago, Little Giant, six; Pierce-Arrow Motor Car Company, Buffalo, N. Y.; Pierce-Arrow, five; Buick Motor Company, Flint, Mich., Buick, five; International Motor Company, New York City, Saurer, five; Columbus Buggy Company, Columbus, O., Columbus electric, four; Dart Manufacturing Company, Waterloo, Ia., Dart, four; Grand Rapids Motor Truck Company, Grand Rapids, Mich., Decatur Hoosier Limited, four; Atterbury Motor Car Company, Buffalo, N. Y., Atterbury, three; Cadillac Motor Car Company, Detroit, Cadillac, three; Cortland Motor Wagon Company, Pittsfield, Mass., Cortland, three; Mais Motor Truck Company, Indianapolis, Ind., Mais, three; Walker Vehicle Company, Chicago, Walker electric, three; Waverley Company, Indianapolis, Ind.; Waverley electric, three; Croxton Motor Company, Washington, Penn., Croxton, two; Grabowsky Power Wagon Company, Detroit Grabowsky, two; Hatfield Company, Elmira, N. Y., Hatfield, two; Martin Carriage Works, York, Penn., Martin, two; Rowe Motor Company, Coatesville, Penn., Rowe, two; Stanley Motor Carriage Company, Newton, Mass., Stanley steam, two; Baker Motor Vehicle Company, Cleveland, O., Baker, electric, one; Wyckoff, Church & Partridge, Inc., New York City, Commer, one; E. E. Denniston Company, Buffalo, N. Y., Denniston, one; H. H. Franklin Manufacturing Company, Syracuse, N. Y., Franklin, one; Studebaker Corporation, Detroit, Flanders, one; R-C-H Corporation, Detroit, Hupp-Yeats electric, one; Knox Automobile Company, Springfield, Mass., Knox, one; Lansden Company, Newark, N. J., Lansden electric, one, Lincoln Motor Car Works, Chicago, Lincoln, one; G. H. Bushnell Press Company, Thompsonville, Conn., Maxim tricar, one; Maxwell-Briscoe Motor Company, Tarrytown, N. Y., Maxwell, one; Metz Company, Beverly, Mass., Metz, one; Morgan Motor Truck Company, Worcester, Mass., Morgan, one; Philadelphia Truck Company, Philadelphia, one; Pope Manufacturing Company, Hartford, Conn., Pope-Hartford, one; Premier Motor Manufacturing Company, Indianapolis, Ind., Premier, one; Alden Sampson Manufacturing Company, Detroit, Sampson, one; Sandusky Auto Parts & Motor Truck Company, Sandusky, O., Sandusky, one; Seitz Automobile & Transportation Company, Wyandott, Mich., Seitz, one; Dayton Motor Car Company, Dayton, O., Stoddard-Dayton, one; E. R. Thomas Motor Car Company, Buffalo, N. Y., Thomas, one; Warren Motor Car Company, Detroit, Warren, one.



Representative Showing Made by Industrial Transports in Philadelphia's Annual Parade as They Appeared on Market Street.

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The MOTOR TRUCK
Devoted to Motor Driven Business Vehicles of All Classes.

VOL. III. PAWTUCKET, R. I., AUGUST, 1912 No. 8

MOVING WITH THREE-TON PEERLESS.

Experience of M. Sweeney Company Indicates Truck Will Do the Work of Four Two-Horse Teams in Hauling Household Goods with Economy in Men and Time.

By C. A. French.

ECONOMIC transportation is a relative term. It is by no means difficult to indicate to the interested business man, who is open to conviction, that it is possible to utilize a motor truck at a substantial saving over horse drawn equipment. Ample illustrations are available, in which it has been demonstrated that a given vehicle could do the work of a stipulated number of horses and at a cost which represents decided economy. However, the problem eventually resolves itself into a proposition as to what can be done by the individual investigator.

It will be conceded that the experience of one concern may not be duplicated by another in a distant city, or even in the same community. Tabulated statements of comparative costs are of undoubted value in a careful study of the haulage problem, and no thoughtful business man will consider the plan of replacing his horse equipment without first obtaining sufficient data of this nature to furnish a basis for computation, at least. But after reaching this point, he must take up the matter of efficiency, for it is a well established fact that the utmost economy is gained only with the maximum efficiency.



Peerless Truck No. 2 in Service with M. Sweeney Company, Fall River, Mass., Hauling Household Furniture on Long Mileage.

With certain lines of business it becomes necessary to consider installations in addition to the purchase of the trucks themselves before it is possible to obtain the results desired. This applies more particularly to the handling of coal, for instance, although it undoubtedly is true, to a certain extent, that before the most satisfactory solution can be reached in practically every case, some thought must be given to this matter.

It must be assumed that the business man is intent upon securing all of the business that he can care for properly. The man who is satisfied with antiquated methods may not need a large investment of capital, but unquestionably the net profits will not indicate the entire possibilities. Moreover, there is always present the danger that the business is receding rather than progressing. This may be applied generally as well as specifically.

If, for instance, a retail merchant relies upon the fact that his townspeople are aware he is in business, and makes no further effort to draw attention to himself or his wares, he soon finds himself a victim of that competition which has demanded that the most successful store advertise consistently, dress its windows attractively and adopt all other legitimate methods of

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keeping its name before the public. Undoubtedly, this added activity means the expenditure of considerable sums, but the increased business secured and the total of net profits resulting are abundant evidence that the investment is worth while.

COMPARATIVE MOVING COSTS.

Fifty Miles by Railroad.

Haulage to freight depot	$10.00
Removing piano to depot	5.00
Freight charge @ 17c a cwt	5.10
Haulage from freight depot	10.00
Removing piano from depot	5.00
Crating furniture	20.00
Hotel bills, two persons, three days	10.00
Total	$65.10

Fifty Miles by Peerless Truck.

M. Sweeney Company's charge	$50.00
Balance in favor of truck	$15.10

The adoption of the mechanical transport is not exactly analogous, it is true, but the example is of value in indicating that it is not always wise to decide against an innovation, simply because the economy is not apparent at the first view. Other factors enter into the installation of motor equipment, than a mere comparison of its cost with that of horse drawn wagons. The careful business man will not dismiss the subject until he has been thoroughly convinced that there is no way in which he may put the new system into operation with resulting profit.

That there are unlimited possibilities is borne out by the experience of those who have added to their business in a field closely allied with that in which they have been engaged. Those who have found that their regular line had not developed sufficiently to permit of using the truck to its maximum efficiency have been surprised to learn that it might be employed advantageously in other work a portion of the time. The experience of the M. Sweeney Company, Fall River, Mass., with three-ton Peerless trucks, made by the Peerless Motor Car Company, Cleveland, O., is of particular interest in this connection.

This concern has been engaged in a general haulage business for a number of years. About two years ago, it was brought face to face with the fact that modern conditions were such that it was being forced to turn away much work that was offered, largely because horses were incapable of undertaking the long hauls involved.

In explanation of this latter statement it should be said that Fall River is approximately 22 miles from Providence, R. I., and that the railroad connections between the two cities is by no means commensurate with the needs in many respects. Passenger traffic is taken care of by an electric road, running express cars at frequent intervals, and while this line is available for freight purposes during certain hours of the night, much of the freight is sent by a roundabout way, or by boat. This condition has resulted in a decided demand for highway transportation for certain classes of goods, notably fruit, produce and other perishable products.

The M. Sweeney Company, as well as other concerns, have endeavored to supply this need, but, as readily may be conjectured, much of this class of work must be undertaken when the weather conditions are by no means the best for horses. In an effort to overcome the difficulties presented, the M. Sweeney Company secured a Peerless touring car in the fall of 1910, this being converted into a one-ton truck. The car was utilized primarily in hauling rush consignments to Providence, and was found particularly valuable in transferring pianos in Fall River. It is still in service, being employed practically all of the time in piano work.

The experience with this converted Peerless car was such that a few months after it was placed in commission, it was decided to purchase a three-ton truck of the same make. By this time, however, a new demand was created.

Several concerns in Boston had been engaged in delivering furniture and other merchandise throughout southeastern Massachusetts by motor truck. The reason for this venture, which proved a decided success from the beginning, lay in the fact that these houses learned that by utilizing mechanical transports they were relieved of the necessity for crating goods sold in this territory. The economy was made up in the elimination of freight charges, reduction in cost of packing, smaller force in the shipping department, and a number of similar items. Naturally, this meant much to the purchaser, who began to wonder whether or not it would be cheaper to move household goods by the same method.

The M. Sweeney Company decided to solve the problem at once. It was impossible to undertake this work with horses, and the only difficulty presenting itself in connection with the trucks was that of securing a satisfactory body. Robert W. Powers, the Fall River agent for the Peerless, has been engaged in the body building business for years, long before the advent of the self-propelled vehicle, and his foreman had

COMPARATIVE EFFICIENCY FACTORS.

Three-Ton Peerless Truck.

	Miles
M. Sweeney Company delivers furniture in Lynn, Mass.	60
Returns to Fall River	60
Takes on load of strawberries for Providence, R. I.	22
Returns for second load	22
Makes second trip to Providence	22
And returns to Fall River	22
Total miles covered in 24 hours	208

Horses.

	Hours
Four-horse team, Fall River-Lynn and return	36
Two two-horse teams, Providence and return	10
Total hours necessary to cover 208 miles on basis of one two-horse team	92
Saving in time in favor of truck	68

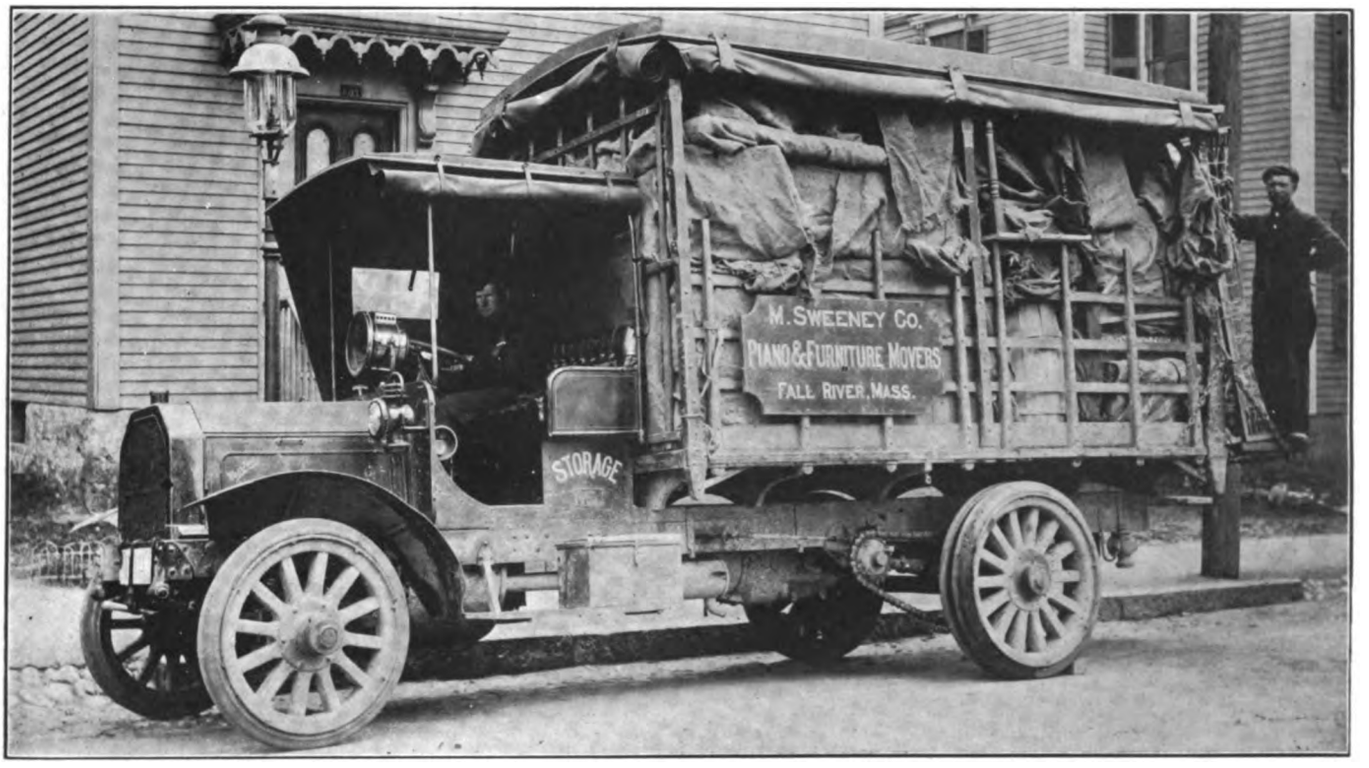
Men.

	Hours
Two men on Lynn trip (truck)	14
One man on Providence trips (truck)	10
Two men on Lynn trip (horses)	36
Two men on Providence trips (horses)	10
Total hours on basis of one man (truck)	38
Total hours on basis of one man (horses)	92
Saving in men's time in favor of truck	54

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little trouble in meeting the needs presented by this case.

The principal requirements of the body were those of permitting compact loading and full protection for the load on the road. Provision is made for extending the top upward some 18 inches, so as to gain as much room as possible under the cover. This telescopic feature is worked out very neatly, six of the uprights being bored to receive stay bolts, which are fitted with wing nuts. Two men can hoist the top into its extended position. The dimensions of the body are such as to accommodate every class of household furniture, this being packed in the most advantageous manner. The roof over the main carrying compartment, as well as that over the driver's seat, is made of slat work, covered with water proof material, and side curtains of



First Three-Ton Peerless Truck Purchased by M. Sweeney Company, Which Has Covered 10,900 Miles in Long Distance Work During Past 15 Months.

the same material provide complete protection for both load and driver in all kinds of weather.

Since April, 1911, when the first three-ton Peerless was placed in service, it has been employed almost constantly in moving work. Of course, the demand was less pronounced at first, and its spare time, if such it may be termed, was utilized to advantage in the Providence freight hauls, or in other work about the city. At the end of a year, in April, 1912, it was found necessary to purchase a second three-ton Peerless, which also is employed in moving work a greater portion of the time.

The plan adopted by the M. Sweeney Company was that of looking over the goods and giving a flat price for the job. It often happens that it is possible to make one trip lead to another, as for instance taking a load of goods to Lynn, there to pick up a load for Worcester, and in Worcester, taking on another cargo for Fall River. If it were possible to make such connections all of the time, the conditions would prove ideal, but it is most generally the case that the return trip must be made empty. It is not to be presumed, however, that the estimate on the work is based on anything other than a fair profit to the transporting company. The long experience in handling goods of this character would preclude the possibility of mistakes of this nature, once the cost of maintaining the truck in service were determined within satisfactory limits.

On the other hand, it hardly will be expected that this class of service would be growing in demand if the patrons were not convinced they were saving money. Just how much is saved in this manner, depends of course upon the haul. Experience indicates that the greater economy to the individual householder is effected on the long hauls, say within a radius of about 50 miles.

An accompanying tabulation sets forth the comparative cost of moving by train and by motor truck, the estimates being based upon a 50-mile haul. The rates between points differ materially, ranging from 15 to 20 cents for each 100 pounds. According to railroad officials, and it undoubtedly will be admitted that they have had wide experience in the matter of transporting household goods, the furniture for the average five or six-room house would weigh about 3000 pounds. This is a conservative estimate, and it is possible that it might reach 4000, including piano. Rates for hauling such goods to and from the railroad station also vary, but $10 a load will be considered a fair average, and

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$5 for handling the piano at either end is by no means excessive. The table shows that it would cost at least $35 for transportation alone, to say nothing of the bill for crating and hotel bills while awaiting the arrival of the furniture. An estimate of three days on the road seems conservative, in view of the experience of many. If it should take longer, the balance would be in favor of the truck.

The M. Sweeney Company would undertake this job for $50 or $60, according to the amount of furniture. The family would spend the night at the old home, and the goods would be in the new house in time for installation the next night. The goods would be handled but twice, once onto the truck and once off again, as compared with six times, at least, under the railroad plan. The possibility of breakage, an item that was not considered in the table, would be minimized. Each truck carries a Pyrene extinguisher on the dash, so that danger from fire practically is eliminated.

It has been stated that this was work which could not be undertaken with horses. It would prove impossible, therefore, to attempt to compare the cost with that of horses. The M. Sweeney Company has kept careful record of the mileage obtained from the trucks, and of course this includes the tires and other equipment. It has been found impractical, however, to compile a statement which would show the actual cost of each vehicle, or to determine just what profit may have resulted from each.

This is due to a number of reasons. On some loads it is found necessary to send four men, while others require but two. Sometimes four men are employed in loading the vehicle, while other help is secured at the end of the journey for unloading. As has been stated, when not utilized for hauling household goods, the trucks are sent on the Providence freight hauls, or may be used for all sorts of jobs in Fall River. Seats have been prepared for all of the vehicles and they are utilized frequently in carrying picnic parties to and from the beaches and other resorts, at night or on Sunday.

They have never been overloaded, and seldom to their rated capacity. The No. 1 vehicle has been driven a trifle over 10,900 miles, and the No. 2 about 3000. The first set of tires on the No. 1 was removed at the end of 7900 miles. Thus far it would appear that the tire cost has been about 3.7 cents a mile. Such gasoline records as are available indicate that a fuel consumption of between five and six miles to the gallon has been obtained. Each truck is fitted with a governor which limits the speed to 15 miles an hour. In the matter of repairs, the company has been extremely fortunate in escaping accidents, and less than $50 has been expended for new parts or adjustments on the two vehicles.

It will be noted that the M. Sweeney Company began its investigation of motor haulage in order to solve a certain problem. It was convinced that the motor truck would handle the Providence hauls to better advantage, if not with greater economy, than horses. The moving proposition did not appear until later. With its Peerless equipment, the company was prepared to meet the emergency when it arrived. Being thus prepared it was enabled to develop a profitable side line, if such it may be termed, which has become a decided factor in the business of the concern.

The Providence hauls are cared for without in any way interfering with the moving work. The trucks have been employed at times 21 hours of the day. When required one of them has covered 200 miles within 24 hours. Of course, horses could not be expected to compete with such service. After delivering a load of furniture in Lynn, leaving Fall River at 6 in the morning, the No. 1 truck has returned to Fall River at 7 in the evening, taken on a load of strawberries and delivered them in Providence, returning to Fall River a second time before 6 the next morning, two shifts of men being employed in the undertaking.

It can matter little whether such an installation will show an economy that can be measured in dollars and cents, at least to the extent of indicating just the amount saved. That these two three-ton Peerless trucks have proved efficient under every condition of service has been sufficient to indicate to the M. Sweeney Company that they have paid a handsome profit on the money invested. It is necessary only to add that when the converted Peerless touring car was originally placed in service, the company was operating 26 horses. It still has 26 horses, and all future equipment will be motor vehicles. The company maintains there are certain kinds of work for which the horses are better adapted, but its experience with mechanical transports is such that it believes it the wiser policy to develop that end of the business.

Still another feature of the matter, and one which undoubtedly weighs heavily with the M. Sweeney Company in this connection, is the economy in barn room, or garage. An accompanying table indicates that were it considered practical to employ horses on long distance haulage of this character, one two-horse team would need 92 hours in which to do the same amount of work. The saving in time in favor of the truck is fixed at 68 hours, suggesting that it would require at least four two-horse teams to do the work of this one three-ton truck. The amount of barn room necessary to house these extra horses and their wagons, to say nothing of the cost of feed, veterinary attendance, shoeing, etc., will represent an economy that cannot readily be reduced to dollars and cents, but which, nevertheless, is decidedly material in considering an investment of this nature.

A Flanders delivery wagon, made by the Studebaker Corporation, Detroit, was recently placed in commission by the Elk Cleaning & Dyeing Company, Cairo, Ill. It is the intention of the dyeing concern to use the automobile in making daily trips to Mounds and Mound City, where formerly a horse and wagon was used, three trips a week being made with it.

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RECORDING DEVICES REVEAL EFFICIENCY.

Problem of Modern Transportation Methods Calls for Installation of Some Means for Checking the Various Factors Which Enter into the Final Solution.

EFFICIENCY and economy are more or less synonymous terms when applied to the solution of the modern transportation problem. Every business man understands the advantage to be gained through the possession of a thoroughly dependable means of reducing the cost of production. This is a factor on which much thought and computation has been expended, until the average manufacturer can tell to the smallest fraction of a cent just what the installation of every modern appliance means to him. It seems strange, therefore, that so little attention has been paid to the matter of transportation charges.

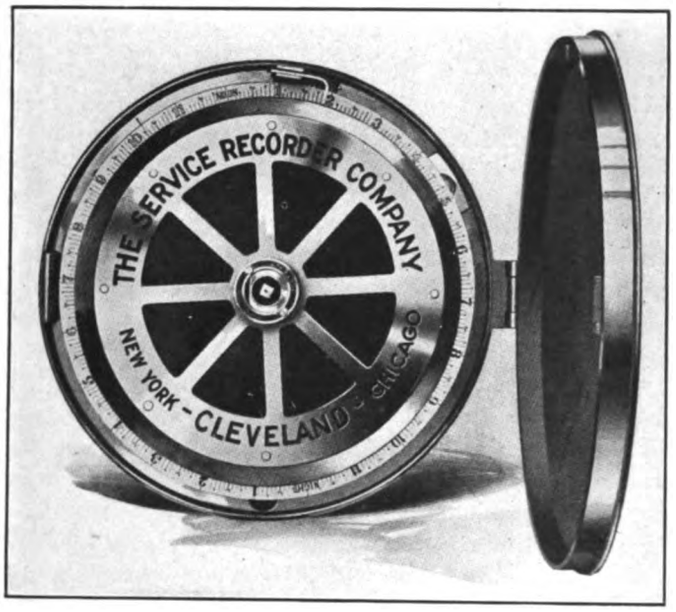


Fig. 1—ServiS Recorder in Its Metal Case, Open for Inspection.

Until the advent of the motor truck, business interests felt compelled to rely upon horses for transportation purposes within restricted limitations, and upon the established transportation companies outside of those districts. That the mechanical transport is capable of replacing both of these methods, at least in a measure, is the claim of its sponsors, and a claim which has been borne out in fact wherever it has been possible to give the proposition a fair trial. However, there are certain factors entering into the problem, which cannot be dismissed without careful consideration.

It has been proven, time and again, that a given truck can do the work of a certain number of horse drawn vehicles at a specified saving in cost of maintenance. Business men are not disposed to question this proof, now that they are beginning to be able to secure accurate data as to the relative cost of horses and motors. However, this is by no means all there is to the problem.

It may be accepted as true that a three-ton truck, for example, will do the work of four two-horse teams, and at a cost which will show a saving, when these two equipments are placed side by side, that should leave no room for doubt as to which were the better investment. But if the business man in question has work for only two two-horse teams, then it becomes a subject for inquiry as to whether it would prove advisable to purchase a three-ton truck. This example is cited merely to indicate that the business man is wholly justified in giving the matter careful study.

It has been demonstrated that economy can be effected. The difficulty lies in bringing about that economy, and it doubtless will be admitted the ultimate result will depend upon efficiency. Therefore, it becomes a matter of seeking the possibility of securing the utmost efficiency from the equipment, no matter whether it be horse drawn or motor driven.

Few business men will be disposed to venture the assertion that they are securing all of the business which rightfully belongs to them. They may have been giving rather more study to the production end, than a closer attention to the transportation end would have made necessary. This undoubtedly is a viewpoint which can best be left to the individual, but it assuredly is worthy of consideration.

It is necessary only to point to the fact that concerns which have given close study to the matter of loading and unloading, for instance, have found that they were able to handle a largely increased business without adding materially to the capital invested.

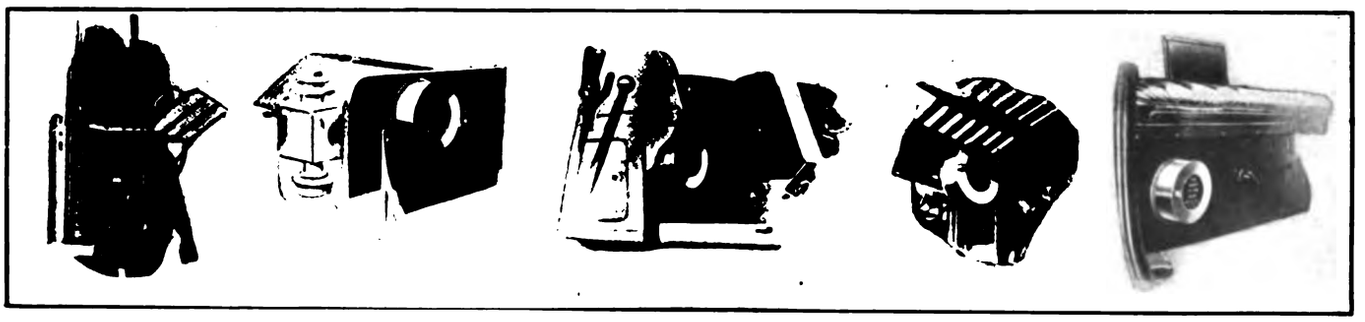


Fig. 2—Showing Some Suggested Installations for the ServiS Recorder, Which May Be Located Anywhere on the Car.

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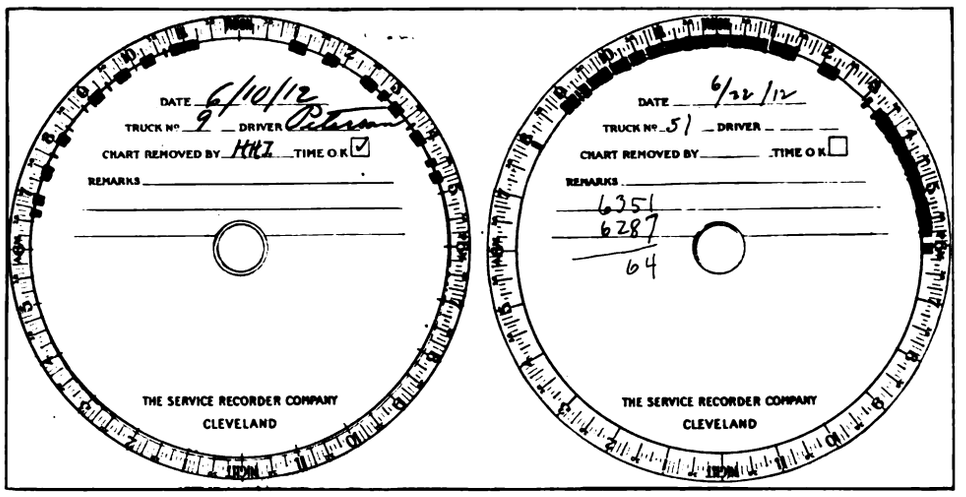


Fig. 3—Typical ServiS Charts: At Left, Utilized by Manufacturing Concern; at Right, by Department Store Delivery System.

This becomes a matter of systematizing the transportation end in a manner which not only discovers the leaks, but offers an effective method of stopping them.

One argument that has been raised against the adoption of the mechanical transport, by some who have been convinced of its relative economy, is that it would necessitate the reorganization of the delivery system. Undoubtedly, this entails considerable expense, since some of these delivery systems mean the expenditure of much money, time, thought and attention. With such concerns it is necessary to point out some more efficient method of obtaining the results for which they are seeking, if they are to be expected to discard that already in force. Still, it ought not to be difficult to dispose of this argument, when it is possible to suggest methods that will eliminate leaks and effect a substantial saving.

Perhaps it was in an effort to meet this argument that travel recorders came into being. Certain it is that they would not have made their appearance had it not been for the fact that the more general use of the motor truck demonstrated their need. They were designed to detect and eliminate leaks, just as quick loading and unloading methods were produced to increase the efficiency of the vehicles. They may be applied to horse drawn wagons, but their greatest usefulness is evident with mechanical conveyances. That they are to play an important part in the solution of the modern transportation problem seems unquestioned.

Irrespective of the method employed, the object of the travel recorder is to register every movement of the vehicle to which it is attached, in order that the owner, or the individual in charge of the transportation system, may have at instant command available data from which to check up the system in vogue. It aims to disclose not only how fast the machine is driven, but how much of the time is employed in useful work. If there are any leaks in the system, they ought to be made apparent, and those in charge should have no difficulty in determining upon the corrective measure.

It follows that the travel recorder is calculated to become an efficiency factor, and as such must make for economy. That each type has some peculiar feature of merit, may be expected. It is not the object of this discussion to suggest the advantage of one type over another, but merely to present the need which they aim to fill and the claims made by the manufacturers of each. Those who are studying the complex problem of transportation undoubtedly will find the descriptions below of decided interest, and they may assist in suggesting a satisfactory solution.

"The man in the box" is the name which has been applied to the ServiS recorder, made by the Service Recorder Company, 2344 East 105th street, Cleveland, O. The designation is signally appropriate, since the device is enclosed in a neat little brass case, which may be located at any convenient place on the car—on the dashboard, under the driver's seat, or as is the case with many department store vehicles, fastened on the wooden frame of the top above the driver's seat. It is claimed by the maker that so long as it is installed parallel with the axle it will register.

The principle is one which may not have become noticeable even to many observant persons; that no motor car, horse wagon, locomotive, or other vehicle can be moved in a forward or backward direction without perceptible oscillation. Even the lightest running automobile cannot be moved across the garage floor without the recorder registering the motion. It is

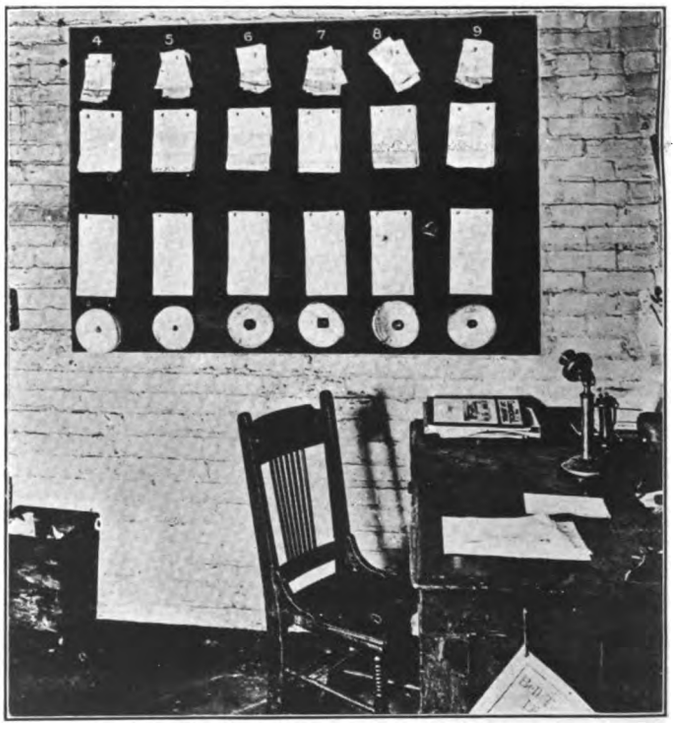


Fig. 4—Bulletin Board Record System Employed by Manufacturing Company.

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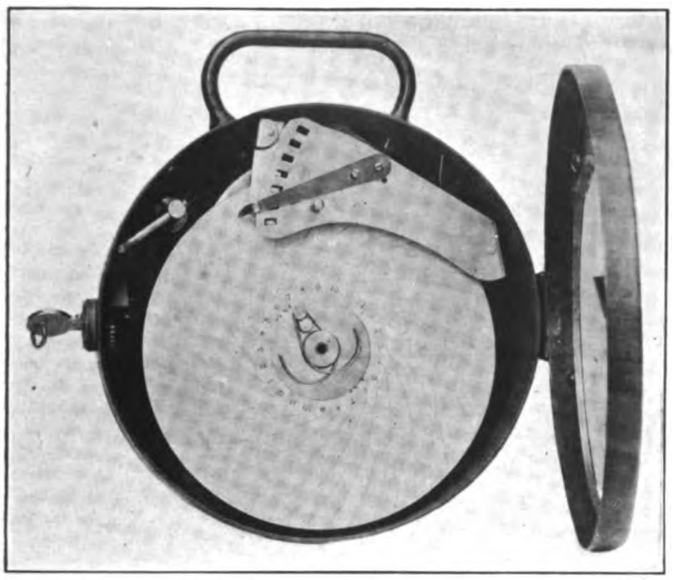


Fig. 5—W. H. Brown's Travelog, Opened to Show Registering Mechanism.

claimed, however, that jarring vibrations and the like are not recorded as travel.

The instrument is patented and has two main mechanical features, the timing and recording mechanisms. The former is a specially designed Seth Thomas eight-day, jewelled movement, built and calibrated to withstand vibration, and securely protected in a sealed housing. It revolves a brass disc once every 24 hours, past a jewel pointed stylus, which registers travel and stop periods on a printed chart of sensitized paper which lies flat on the disc and revolves with it. The stylus, being attached to one end of a free swinging pendulum, marks a thin, clear line on the chart so long as the vehicle is quiet and the pendulum at rest. But when the truck is in motion the pendulum is agitated to and fro and the stylus records on the chart a broad "travel" line about .25 inch wide. It is said to be absolutely impossible to fake these lines.

The chart is printed to resemble a 24-hour clock dial, the smallest graduation representing a five-minute period. The travel and stop lines are registered faithfully on the margin of the chart, indicating the exact length of every stop and the duration of every travel period, as well as the exact time at which each occurred, so that the owner has at any time a detailed, legible, accurate record of the truck's movements—a complete check on his vehicle. The value of this is, of course, obvious at once.

The owner or the delivery superintendent can tell at a glance whether his cars are working to their full capacity, whether the drivers are killing time, whether the trucks are being delayed unduly on the road, whether the shipping clerk is holding them up longer than necessary at the shipping stations, whether they are being used at wrong hours, etc. In short, the recorder gives information concerning the efficient driver, uncovers the "loafer," discloses costly leaks of time in the shipping department, checks up overtime use of the trucks, puts a ban on fast driving and consequent unnecessary wear and tear on the mechanism, by removing the temptation to loaf and then make up time on the road. Not only does the chart disclose the inefficient or poor driver, but it also brings to light the capable man, whose ability was perhaps not fully realized before.

Accompanying illustrations present the device and set forth its method of operation in a measure. Referring to the left of Fig. 3, this chart shows that the truck was started at 6:35 in the morning, and that it was busy making deliveries, some of them close together and others far apart, some stops being of short duration and others longer, until 11:30, at which time, it is presumed that the driver went to lunch. It resumed operations at 1 in the afternoon and continued its delivery work until 4:50, when it was through for the night. This chart shows one day's work with a manufacturing concern in Cleveland, O.

The chart shown at the right of Fig. 3 represents one day's work with a department store in that city. Here the driver was at the garage just before 8 in the morning and took the truck around to the store, where it was standing until 8:50, getting its load. It was busy making deliveries, with very few long waits, until 1:30 in the afternoon, when it returned to the store and made another short run before lunch at 2:20. After lunch it was driven to the store, loaded a third load and was busy until 5:50. After returning to the store at this hour, there was nothing more to do that day, and it was driven to the garage, where it arrived at about 6:05, and was put up for the night.

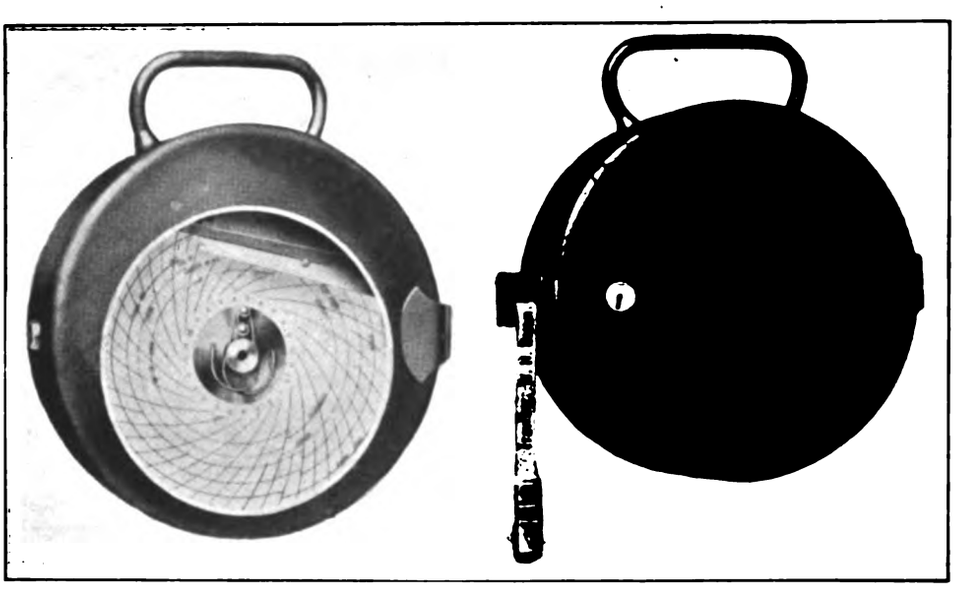


Fig. 6—Front and Rear Views of the Brown Travelog Instrument, Locked and Ready for Installation.

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The manufacturing concern in question operates a battery of 3.5-ton gasoline vehicles, exclusively, in its heavy haulage work. Each truck is equipped with a ServiS recorder. In the garage manager's office hangs a bulletin board, shown at Fig. 4, upon which is kept in the vertical columns the individual records of each driver and his truck. In the top row, just underneath the truck numbers, are filed the gasoline requisitions, and below these hangs each truck's daily shipping record, showing tonnage, destinations, and time of arrival and departure as marked by the shipping clerks. On the next to the bottom row are the monthly record cards, showing the summary of the daily records of gasoline consumption, mileage, hours of service and tonnage hauled. The circular charts at the bottom are the ServiS record charts, used to check the shipping clerk's records, hours of service, overtime, and all stops and delays. In this particular case, the drivers insert the charts and the superintendent removes them. A spirit of friendly competition has grown up among the drivers and the record shown on the charts and the monthly expense summaries has resulted in two especially efficient drivers being given deserved increases in salary.

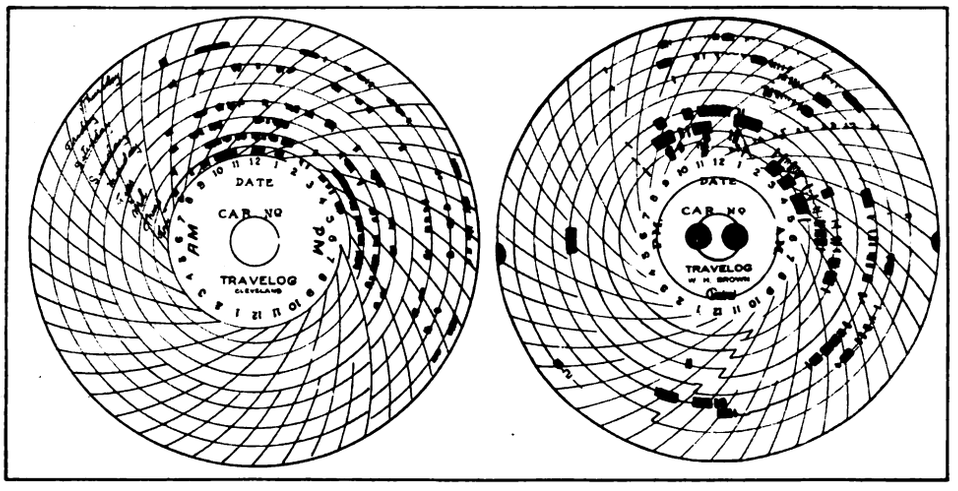


Fig. 7— Specimen Travelog Charts: At Left, Truck Hauling Machinery; at Right, Special Car on Night Work.

The department store mentioned bases its delivery system directly upon the ServiS recorder. Each morning the store timekeeper inserts fresh charts in the machines attached to the company's fleet of electric and gasoline wagons, noting on the charts removed the mileage of the previous day. He supplements this chart record with a delivery car report for a record of the number of deliveries, causes of delays of 10 minutes or over, and accidents or car trouble. It takes but a moment's glance at the chart and the driver's record of his delays; to inform the superintendent fully, and the knowledge that every minute's time during the working day must be accounted for is an effective moral stimulus to the driver. It is stated of one department store that the definite knowledge of certain savings effected by the use of these recorders was sufficient to pay for the instrument in two months' time. This is a usual report.

Another Cleveland product of the same nature is the Travelog, made by W. H. Brown, 706 Rose building. While it may be stated that the principle upon which it works is similar, it differs materially from that previously described, in that it permits the recording of an entire week's work, instead of one day only. The object sought is the same; namely, a complete record of the day's work, showing starting time, time of all runs and stops, quitting time, overtime, and all other details which will enable the owner or superintendent to detect leaks and suggest a remedy.

The maker cites the fact that although a large majority of men are conscientiously working for the better interests of their employers, the time clock has been found a necessity. These usually are installed indoors, where most of the work is done under the eyes of the directing foreman. If some method of detecting leaks is recognized as important under such conditions, it must follow that similar arguments will apply outside, where drivers are placed in charge of expensive installations that are utilized under conditions which limit the watchful supervision.

This does not necessarily imply that the driver is lax in his duties, as already has been pointed out. The object of the Travelog is to show where the delays occur, and it transpires more often than otherwise that these are due quite as much to the routing system adopted, as to the inefficiency of the operator. The Travelog possesses a number of special advantages, as well.

The maker claims the device is so sensitive that it records even when the car is touched, the principle employed being that it is actuated by the vibration of the car. The mechanism comprises an eight-day, 11-jewel standard Howard clock movement, with actuating parts of cold rolled steel, enclosed in a pressed steel case and secured with a Yale lock. It may be located on any part of the car, a bracket attachment being furnished with the case.

Two of the Travelog charts are shown herewith, and it will be noted that provision is made for automatically making a whole week's record without removing the chart. The clock also is wound weekly. The instrument is installed with an open or glass front, possessing the added advantage of affording the operator opportunity to see his record in the making, as well as to read the time of day. The case is about 7.5 inches in diameter, and the chart is a six-inch disc of prepared paper divided into 24-hour periods indicated by radial lines with hour numerals at the centre, half-hours being indicated by half-lines and shorter intervals being measured by

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sight. The marker traces a fine circular line while the vehicle is standing, and a broad band while running. Each succeeding day the marker drops toward the centre to delineate a new circle.

The Travelog chart at the left of Fig. 7 was made on a truck hauling machinery. In order to explain fully the runs and stops for the first two days, as an example, it may be stated that the first day, Thursday, the chart was put on at 11:30 in the morning. The truck was moving from 12:40 until 1; 1:25 to 1:35; 1:50 to 2:05; 2:15 to 2:20; 2:30 to 3; 3:30 to 3:55; 4:15 to 4:25, and quit for the day. Friday, the crew left the garage at 6:25 and drove to the storehouse, arriving at 6:35. It left the storehouse at 7:10 and was moving until 7:50. There was a wait until 9:15, after which it ran until 9:40, and ran as follows throughout the remainder of the day: 9:45 to 9:50; 10:15 to 10:25; 10:35 to 10:55, with short stops intervening; 11:15 to 11:50; 1 to 1:05; 1:10 for a short time; 1:45 to 1:50; 2 to 2:10; 2:40 to 2:50; 3:50 to 3:55 and 4:15 to 4:20, when it quit for the day. It also will be noted that the truck began operations each day as follows: Friday, 6:25; Saturday, 6:45; Sunday, rest; Monday, 6:45; Tuesday, 7; Wednesday, 7; Thursday, 7; Friday, 7:20. It quit each day as follows: Thursday, 4:25; Friday, 4:20; Saturday, 4:25; Sunday, rest; Monday, 5:30; Tuesday, 5:30; Wednesday, 5:40; Thursday, 4:15; Friday, taken off at 9 in the morning.

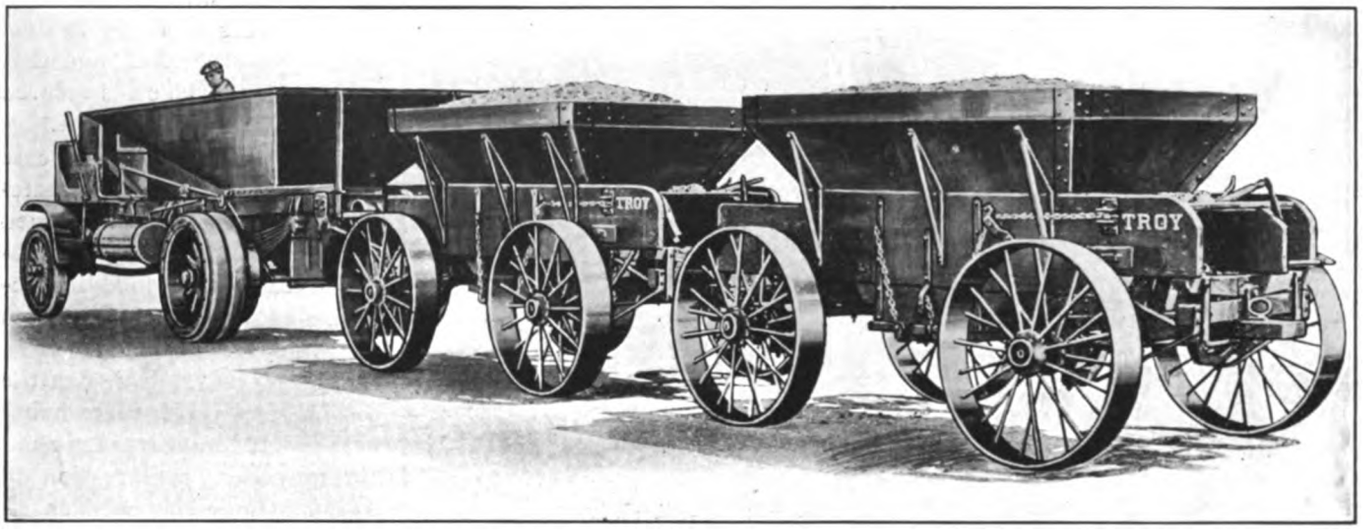
The other Travelog chart was taken from a special car on night work. It shows that the crew boarded the truck at 5:50 in the afternoon of the 21st and started work at 7, going off at 11:30 the next morning. The second day the crew took charge at 6 and the vehicle was in service from 7 in the evening until 5:45 in the morning, with a long hold-up between 11:45 to 3. The 23rd the crew did not show up until 7:40 in the evening, and the truck did not start until 10:05. At 11:25 it was held up until 1:45, and the crew quit work at 6:40 in the morning. The 24th was Sunday, but Saturday afternoon the car was used for about an hour between 2:30 and 3:30 in the afternoon, evidently on another job. And thus the record goes on until the end of the week.

Wherever the Travelog has been given a trial it has demonstrated its value. In each instance it has been the means of detecting costly leaks, such as indicated in the chart given above at the right of Fig. 7. In this particular case the second week showed a considerably less loss of time, and the third week developed a saving of nearly 10 hours during the seven days. It is not difficult to estimate the amount of money resulting from a saving of 10 hours a week, year in and year out, and the initial cost of a Travelog under such circumstances is a decidedly minor consideration.

(To Be Continued.)

KNOX IN ROAD BUILDING.

Modern road construction is making good use of the motor truck. An accompanying illustration shows a six-ton Knox, made by the Knox Automobile Company, Springfield, Mass., hauling two trailers of three yards capacity each. Two of these trains have been in active service for the past year in Sioux City, Ia., and have made a remarkable record for efficiency, having delivered an average of 44.5 yards of material a day, the average distance being 3.5 miles.



Knox Six-Ton Truck Hauling Two Three-Yard Trailers in Road Construction Work in Sioux City, Ia.

Both truck and trailers are fitted with special quick dumping bodies, which facilitate delivery. The contractors estimate that it would have required at least 10 two-horse teams to have done the same amount of work, and that the cost of such equipment would have been more than twice as much as that of the Knox outfit.

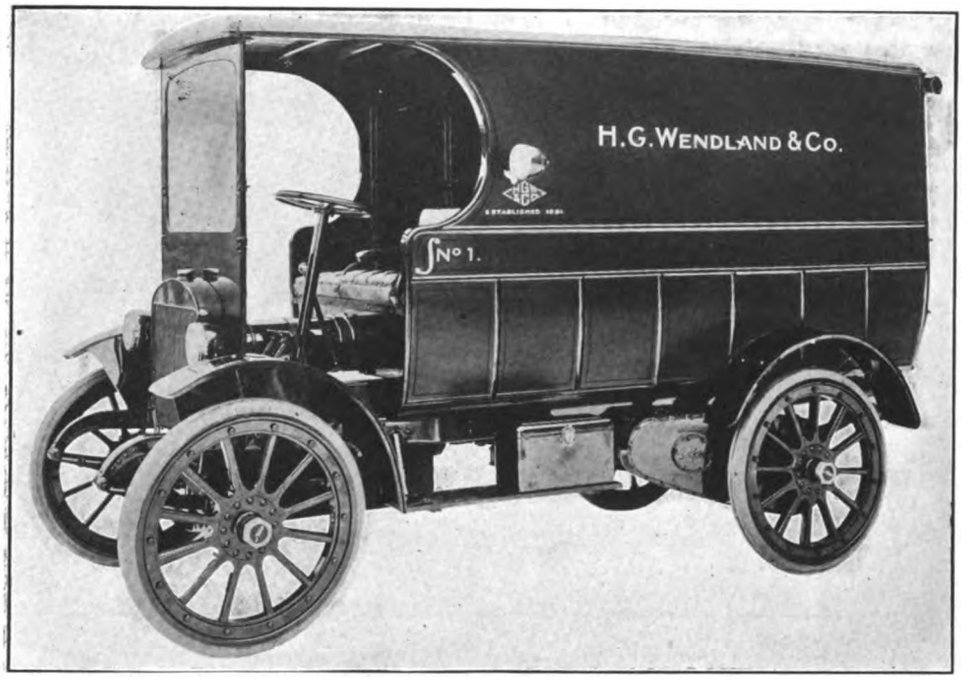
Grades varying from three to 7.5 per cent. were negotiated without difficulty, and while the practise of hauling such heavy loads by this method on grades puts an unreasonable strain on the motor truck and therefore is not sanctioned by manufacturers, it nevertheless demonstrates the strength and power of Knox construction.

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SIMPLICITY OF NATCO ONE-TON TRUCK.

MANUFACTURED and guaranteed by a company which has been producing for a number of years the most intricate and complex parts for the leading automobile manufacturers, the Natco type 15 truck of one ton capacity will appeal to those seeking a high grade commercial vehicle capable of efficient service at a low cost of maintenance. Throughout the best of material and workmanship are incorporated and particular attention has been paid by the designer to interchangeability and standardization, important factors in the upkeep of the power wagon, facilitating as they do, the replacement of parts in the event of accident or wear.

Believing that specific service requirements must determine the character of the general as well as the detailed design of a mechanical transport, the National Motor Truck Company, Bay City, Mich., which is under the same management as the National Cycle & Manufacturing Company, has placed the motor under the deck, making for ease of operation where the streets are narrow and traffic congested. The company also points out that its product is particularly adapted to transportation where frequent stops are made, and among other features emphasized is that of an even distribution of load, approximately 60 per cent. being on the rear wheels, and 40 on the front, an arrangement making for efficient traction as well as effecting considerable saving in the cost of operation. A number of standard body designs are produced by the company, these including panel, screen side, express and stake. Bodies of special design and dimensions are constructed to suit the requirements of the purchaser, and the company also furnishes frame prints with scaled dimensions to those who desire to build their own bodies to meet individual requirements.



Natco One-Ton Truck Equipped with Panel Delivery Type Body—The Driver Is Located at Left with Motor Under the Deck, Design Providing Maximum Carrying Space.

In designing the power plant the company took into consideration the fact that many trucks are driven by inexperienced operators and it was maintained that to produce a highly efficient motor it should be fool proof and free from complicated devices with which the chauffeur could tamper. The matter of control is not regulated by any form of governor other than the fixed ignition, the company holding that the simpler the design the less temptation is presented for experimentation upon the part of the driver.

The Natco motor is of the short, compact, long-stroke type, its bore being 3.5 inches and the stroke five, a ratio of stroke to bore of 1.43 to one, and providing a piston displacement of 192.2 cubic inches. Although the S. A. E. formula rates the motor at about 20 horsepower, it will develop greatly in excess of this because of its long stroke. It is also pointed out that the long stroke favors economy in fuel and registration fees, and that maximum service is assured with minimum adjustment.

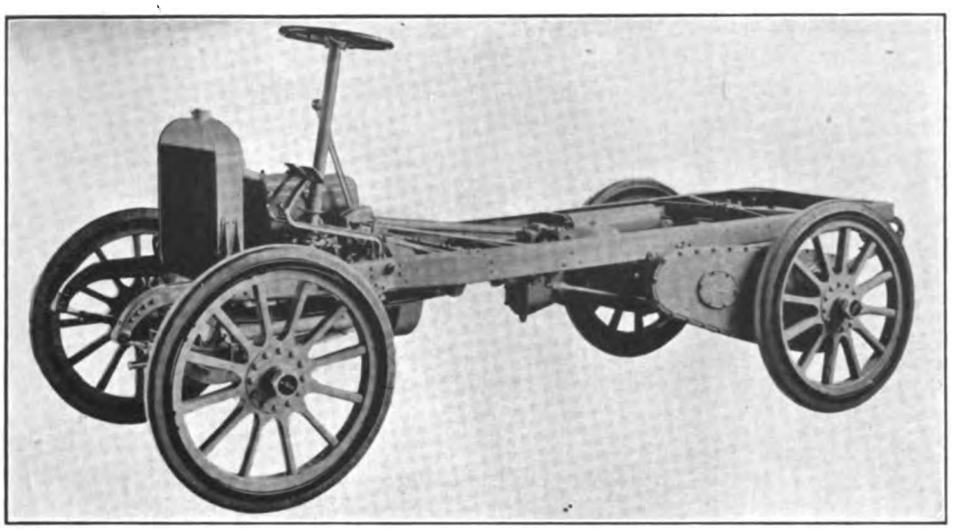
The four cylinders are cast en bloc of a high grade material and are carefully machined and ground, tested and subjected to a rigid final inspection. The same careful methods are utilized in the construction, machining and finishing of the pistons and rings, these being held to fine limits, a practise insuring even compression on each cylinder, as well as efficiency.

The crankshaft and camshaft are of a high grade steel, accurately ground to size and rotate in generous bearings having an extreme low bearing pressure a square inch. The connecting rods are also of high grade material, the wristpin being carefully retained and fitted and so designed that it is properly lubricated at all times.

The inlet and exhaust valves are located on the right hand side of the motor, are of liberal size, and the springs, etc., are fully enclosed, a design making for efficiency of operation and economy of upkeep. Although all foreign elements are excluded, the member may be reached easily when desired, the retaining plate being neat in design and readily accessible; in fact, throughout the Natco motor is noticeable for its simplicity.

In locating the carburetor the designer has placed it at the left of the motor with the magneto at the right, a commendable location, as any possible chance for fire through a spark from the ignition member is

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Chassis of Natco Truck, Noticeable for Simplicity and Accessibility of Parts, Which Are High Grade and Carefully Finished—Note Compactness of Power Plant and Straight Line Drive.

eliminated by this construction. A feature of the carburetion system is that the intake pipe is short, free from bends and curves, and being carefully machined and fitted to the cylinder prevents possible auxiliary air diluting the mixture. Control of the gas is by lever on top of the steering wheel and a feature is that the member is extended nearly to the rim of the wheel, permitting the driver to actuate the lever without removing his hand from the wheel.

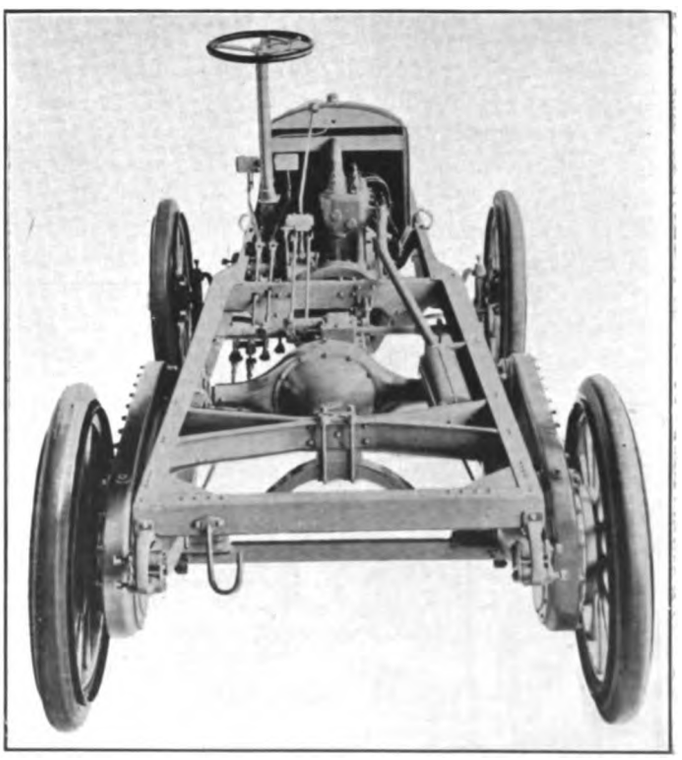
A true high-tension magneto is employed, gear driven with pinions enclosed, and the spark is fixed; that is, its time cannot be advanced or retarded by the driver, it being held by the company that it provides the ideal system for commercial vehicles, which should be operated at a moderate speed, and that improper advance of the spark is prevented. It is also pointed out that greater efficiency will be derived from the power plant, as the spark will occur at the proper position of the piston, eliminating too early ignition and undue stresses thereby upon the working parts of the motor.

Believing that the life of a motor and the maintenance of its maximum efficiency is dependent upon constant and uniform lubrication, the maker of the Natco truck utilizes a novel system which is presented in an accompanying illustration. It is a well established fact that excessive lubrication results in the rapid formation of carbon, and that eventually the accumulation of deposits causes heating, loss of power and pre-ignition.

A positive, mechanically operated system is claimed for the Natco method, the noteworthy feature of which is that although the lubricant is employed over and over again, it is filtered before it is delivered to the pump. It will be noted that the main reservoir is located at the bottom of the crankcase and has a capacity of six quarts. The pumps, which are gear driven from the camshaft, are located in the forward compartment from which lead pipes, these supplying the lubricant to the end bearings of the crankshaft and to a sight feed device in full view of the operator.

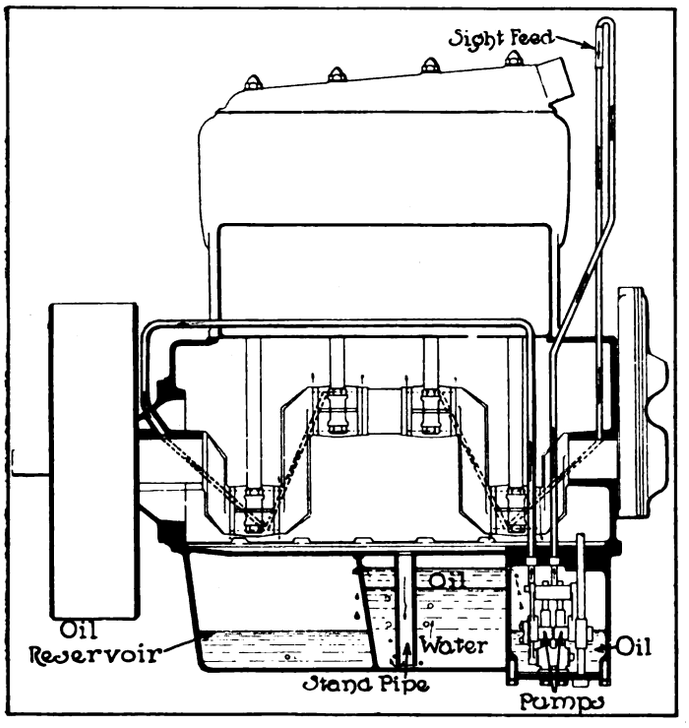
The passage of the oil will be noted by the dotted lines, and after lubricating the parts outlined in the drawing, the lubricant returns to the main supply tank through a standpipe, the latter extending to within .375 inch of the bottom of the water compartment as indicated. Owing to the difference in the specific gravity of oil and water, the former rises to the top and overflows into the main reservoir. During its passage through the water the carbon is separated from the oil and the precipitations fall to the bottom of the compartment, whence they may be removed easily. Another advantage emphasized by the designer is that the oil is cooled, maintaining its value. The capacity and design of the system are such that the supply requires replenishing but once a month.

As the commercial vehicle is operated at low speeds and the motor is frequently left running when discharging loads, the subject of cooling has been given thoughtful consideration by the designer. The water jackets of the motor are liberal in size as are the inlet and exhaust pipes, assuring proper flow of the fluid at all times. The cooled fluid enters the motor at the left hand side and after circulating through the jackets and around the valves, etc., passes out through the manifold at the top, thence by a pipe of large diameter to the radiator. The latter is of the



The Frame Is Sturdily Constructed and Securely Braced by Cross Members—Note Method of Supporting Auxiliary Spring.

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The Natco Oiling System Is Novel, the Lubricant Being Filtered through Water to Remove Carbon and Impurities.

vertical tube type, having ample water capacity, and it is suspended by springs, eliminating all road shocks as well as stresses. Cooling is also assisted by the flywheel, which is fitted with fan shaped blades, these drawing the heated air from around the power plant and expelling it at the rear of the chassis.

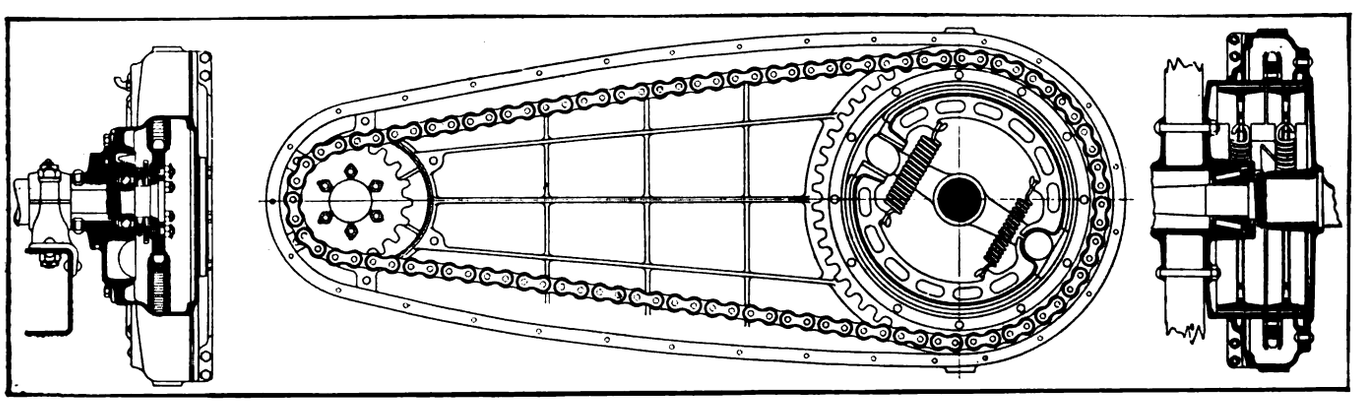
Power from the motor is transmitted through a cone clutch and shaft to the transmission. The clutch is faced with leather, also equipped with compression springs, these eliminating harsh engagement and slipping, as well as providing means for adjustment. A straight line drive is provided from clutch to transmission, thereby delivering full efficiency of the motor to the driving sprockets.

A selective type of transmission is employed, providing three speeds forward and reverse, and all gears are of a high grade material, carefully cut and operate in liberal sized bearings. The transmission case is oil and dust proof, provided with ample sized inspection cover, and is secured to the differential and jackshaft housing. Interposed between the latter and the clutch are two cross members, these being of sturdy construction, and serving to carry the brake equalizing mechanism and torque rod. The latter is securely braced to the transmission housing and extends forward, where it is attached to the front cross member. Its design and that of the jackshaft housing make for a rugged construction as well as accessibility of parts. In this respect the large inspection cover to the differential is worthy of consideration as the gears and bearings may be reached easily and any desired adjustments made. The supply of lubricant may be replenished through a filler plug on the top of the housing.

Final drive is by chains, and elongation and unnecessary wear of these members through exposure to dust and foreign elements is prevented by the utilization of a chain case. The latter is supported at the axle end on the steel brake shoe support, which is riveted solid to the main case casting, the upper end being supported by an eccentric adjusting member. The distance between the rear axle and jackshaft may be increased or diminished by rotating the chain case adjuster on the countershaft end housing by means of a spanner wrench, the rotating and stationary parts being permanently locked when the desired adjustment of the chains is obtained.

A micrometer adjustment is provided on the stationary and rotating members, this facilitating the work as well as insuring accuracy and enabling a parallel alignment of countershaft and rear axle. In performing the work the chain case is not disturbed. Being oil tight and dust proof, it insures high efficiency as well as long life to the sprockets and chains. Provision is made for replenishing of the supply of oil through the medium of a filler cap, this being located directly over the rear sprocket.

Steering is by the conventional hand wheel, located at the left, and the gear is of the worm and wheel type, semi-reversible. The brakes are ample in size, of the internal type located on the rear wheels. The service member is operated by the right pedal, which also actuates the clutch, while the emergency is operated by a pedal at the left and is provided with a ratchet lock. The gear shifting lever is slightly at the left of centre and at the right of the driver. It will be noted that the control is simple, and that only when changing



Driving Chains Are Enclosed in Dust and Oil Proof Cases, Making for Long Life—A Feature Is the Provision for Accurate Adjustment and Alignment.

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speeds is the operator obliged to remove his hand from the steering wheel, an arrangement making for safety when operating in crowded traffic.

The frame of the Natco is of very substantial design, of pressed steel channel sections, and is unusually well braced by cross members, especially the X section to which is secured the supplementary transverse spring. The channels are very deep, insuring rigidity as well as stability as is the sub-frame supporting the power plant.

Semi-elliptic springs, 2.25 inches wide and 39 long, are fitted in front, the rear being of the same design, but 52 inches long. Ample provision is made for the lubrication of the spring shackle bolts, two grease cups being fitted to each member. Rectangular section axles are employed both front and rear. Solid tires, 36 by 3.5 inches, are utilized on detachable rims, both front and rear. The wheelbase is 104 inches, tread 56, and the weight of the chassis 2400 pounds.

WHITE TRUCKS IN RUSSIAN ARMY TRIALS.

FORTY-FIVE cars and trucks took part in the recent road trials conducted by the Russian government for the purpose of determining the adaptability of motor vehicles for army service in all its branches. Of these, five were White machines, made by the White Company, Cleveland, O., and it may be said that America's representation in the tests conducted themselves with all due regard for the country of their origin. They were two five-passenger, 30 horsepower touring cars, two 30 horsepower ambulances utilizing the regulation White three-quarter ton chassis, and one 1.5-ton capacity, 30 horsepower truck, fitted with tank body for carrying the fuel supply for the tour.



Czar Nicholas Inspecting the White Squadron at the Successful Completion of the Recent Russian Army Reliability Run.

The route covered started from St. Petersburg, circled around through Moscow, and then returned over a different course to the Russian capital, the entire distance traversed being about 1960 English miles. The road conditions were indescribable. In many places there were no roads at all, the course being across sand hills, over fields and plough ground, and through forest trails. The best idea of the travelling conditions may be gained from the fact that it was necessary to precede the tourist by a detachment of army bridge builders in order to make it possible for the cars to get through at all.

Besides the White entrants, the flower of European manufacturers was represented, including the makers of the Mercedes, Benz, Napier, Saurer, Clement, Lancia, Berliet, Charron, Laurin, Buire, Vauxhall and others. The run during the last three days was made at high speed over hard, rough roads, and was extremely exacting. Thirty-five cars finished the trip, among which were the five White contestants, with a record for a lower fuel and oil consumption than any of the European machines. Each of the five came through the entire trip without mechanical trouble of any description, and created the most enthusiastic admiration of the Russian officials who supervised the tests.

At the conclusion of the trials, the surviving contestants were assembled at Peterhoff, where they were personally inspected by the Czar, the minister of war, and the high officials of the Russian army. The White squadron came in for the lion's share of the Emperor's attention, and an accompanying illustration shows him inspecting the fleet. The Czar is standing just to the right of the telegraph pole, while the third figure to the left of the pole is Gen. Suchomlinoff, minister of war. The officer standing at the Czar's right is Gen. Dobrecshin, who was in command of the trials.

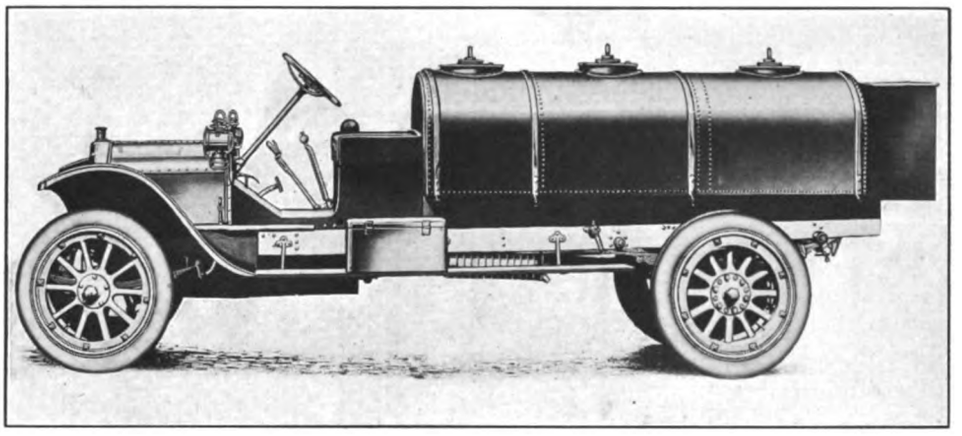
After the royal inspection, all of the contesting cars were completely dismantled and every part was subjected to a most careful scrutiny for wear and deterior-

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ation. The commission of experts which conducted this examination reported that every one of the five White cars and trucks was in absolutely perfect condition. This report was followed by another from the army officials certifying that the White cars were highly suitable in every respect for the requirements of the Russian army service, and recommending that the entire fleet be purchased by the war department. The next day the squadron became the property of the Russian government.

The result of the trials and the subsequent action of the Russian army is naturally very gratifying to the White Company, particularly as the machines won in a most severe contest against the representative cars of Europe. While practically all of the foreign made machines were looked after by factory experts, the White team was taken care of by men from the London office of the White Company and its agency in St. Petersburg, no factory representatives being present.

One of the significant features brought out by the competition was the fact that the White car, conforming closely in general design to European ideas and practise, has, by a combination of American genius and American advanced methods of manufacture, reached a degree of perfection not yet attained by the very machines from which it was originally designed.



White 1.5-Ton Truck Which Carried the Fuel Supply for Russian Army Trials.

WINTER GENERAL MANAGER.

H. L. Winter has resigned his position as sales manager of the Federal Motor Truck Company of Detroit and entered the employ of the Universal Motor Truck Company of the same city as general sales manager. He left Detroit recently on a trip, which will take him to all the agencies of the concern in the country, and which will enable him to become acquainted with the trade and its need.

HAULING YARNS WITH G. M. C.

Those who are familiar with the topography of Manayunk, Penn., a suburb of Philadelphia, do not need to be told that the grades are decidedly excessive. On many streets it would be extremely difficult to operate a motor car to advantage, and in almost every instance the conditions in this respect are such as to test the capacity of the commercial vehicle unduly. William Spink, manufacturer of velvet and axminster yarns, has not hesitated to adopt motor transportation, however. After giving the matter thorough investigation, he decided upon a 3.5-ton G. M. C. gasoline truck, made by the General Motors Company, Detroit, to which a special type of body was fitted, capable of carrying the yarns to the best advantage. As yet he has had no reason to regret his decision, despite the peculiar street conditions.

DURABLE DAYTONS CREATE SAVING.

Two durable Dayton five-ton trucks, made by the Dayton Auto Truck Company, Dayton, O., have been used with remarkable success for several months by the Dillon Teaming Company, San Francisco, Cal. The vehicles are used in and about San Francisco for hauling brick, and many times have been called upon to travel steep grades. They are equipped with side dumping bodies and carry 2000 brick to the load, a weight of about 12,000 pounds. Recently brick was carted to Presidio, a distance of seven miles. Three trips a day were made, each truck carting 6000 brick. Teams formerly used in this work made but one trip a day, carrying 1000 brick, so that it can be seen that one truck does the work of six teams. Comparative figures kept by the company show that the cost of operating a truck, figuring interest, depreciation and costs of materials and supplies, is $14.92 a day, while the cost for the six teams which it replaces, would be $36, a saving each day of $21.08 in favor of the truck.

MOTZ TIRE SERVICE.

It makes no difference whether the car is electrically driven or propelled by gasoline motor, or what kind of light delivery duty it performs, according to the Motz Tire & Rubber Company, Akron, O., it will be found advantageous to equip it with Motz cushion tires. Three distinct advantages are claimed to the commercial vehicle owner; protection to the delicate mechanical parts of the car, saving in power and saving in tire expense. This last item is based upon the guarantee of 10,000 miles, sufficient to give the average owner two years' service.

John N. Willys, president of the Willys-Overland Company, Toledo, O., has been elected vice president of the Hexter Motor Truck Company, New York City, metropolitan agent for the Gramm truck.

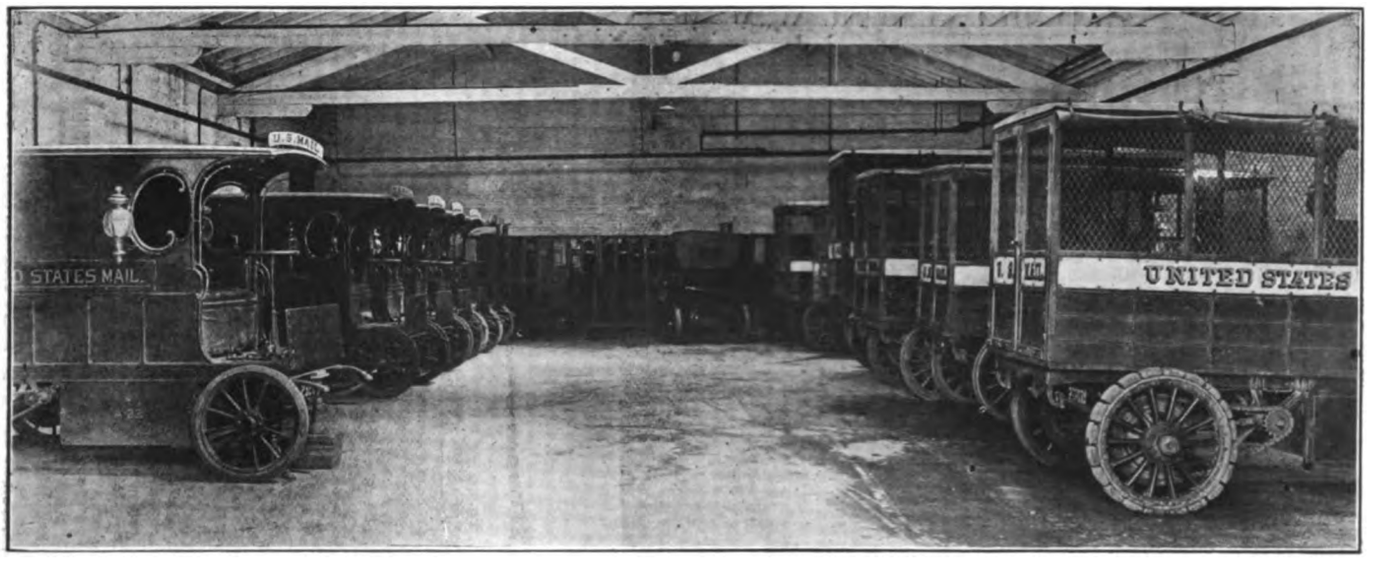
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ELECTRIC WAGONS IN POSTAL SERVICE.

Motor Delivery Company, Working Under Horse Contract in New York City, Meets Every Department Requirement and at an Expense Less Than the Estimates for Haulage—Practical Accounting and the Results Obtained.

By William W. Scott.

THE endurance of the electric vehicle under particularly exacting conditions is illustrated by the service of the Motor Delivery Company of New York City, which was inaugurated early in the spring of 1909 and has been continued since that time. In a period of more than three years during which the work has continued uninterrupted, a record has been kept that will account for every foot of distance each wagon has been driven, and every cent expended for operation and maintenance of each machine, so it will be understood that what can be stated of this company has been thoroughly established by actual experience, and should not be regarded as approximation, estimate or theory.



The Interior of the Garage of the Motor Delivery Company, Lawrence Street, New York City, as Seen from the Entrance, Showing the Types of Wagons in Service.

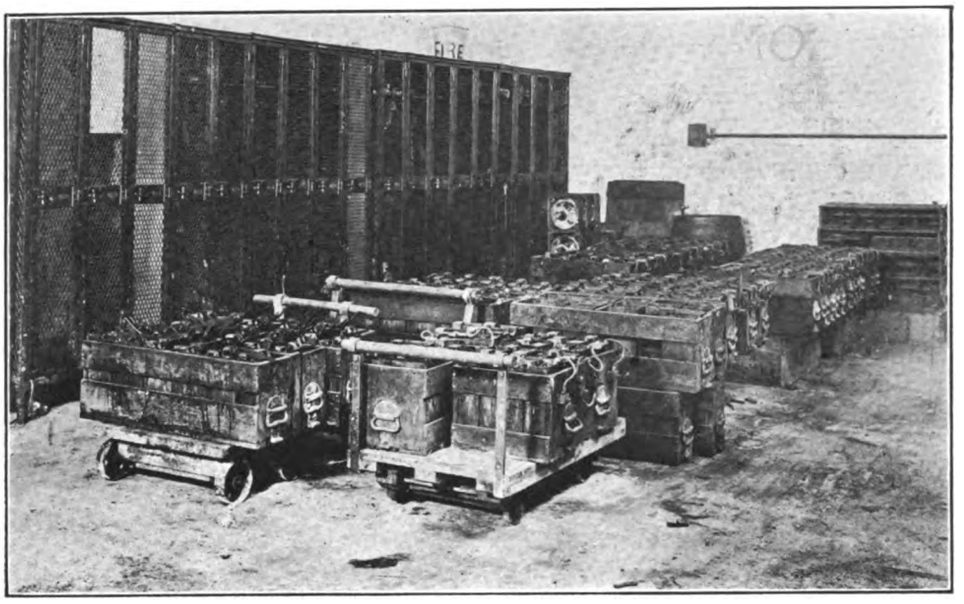
This is a service exclusively of electric wagons and it was begun with new machines, so that there has been opportunity to reach determinations by close and systematic observation of the work accomplished, and to profit by each experience. The company has contract for transporting mail between the sub-stations of the New York postoffice, in that section of the city north of 42nd street to 180th street on the west side and to Fordham on the east side, hauling collections from the one sub-station to another and from them all to 42nd street, which is the central point for downtown delivery, and delivering mail for distribution from 42nd street station to the other sub-stations.

Manager Bardwell of the company has had a long experience with highway transportation, for he was identified with several concerns engaged in this work, both in Boston and New York, and as with these horses were used it may be said that the greater part of his business life he has been engaged in animal haulage. It has been necessary for him to familiarize himself with every detail of trucking and expressage services, and having charge of departments and organizations necessity has impelled him to specially direct his attention to subjects that under ordinary circumstances might not be regarded as important. Or, to put it another way, Manager Bardwell's experience has been such that he has been required to educate himself in every phase of vehicular transportation, at least to the standards of the large contracting concerns with which he has been associated, and this knowledge has been of decided value to him in working out the problems that have been met with in his administration of the Motor Delivery Company.

There are those who will comment upon the emphasis laid upon Mr. Bardwell's experience, and will observe that a man associated with haulage contractors of New York and Boston ought to be thoroughly informed. If this comment can be created the purpose of the writer has been accomplished, which is to demonstrate that a man who had had only horse experience has taken up motor vehicle haulage, and, while having good advice and no doubt profiting by it, has had to meet conditons which would not under ordinary circumstances, at least, be met with by the average concern conducting a transportation business or making its own delivery.

To illustrate: It has been the custom of most firms and individuals requiring the use of highway transport to experiment with motor vehicles, using

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Corner of the Main Garage Floor Given Over to the Care and Maintenance of the Batteries.

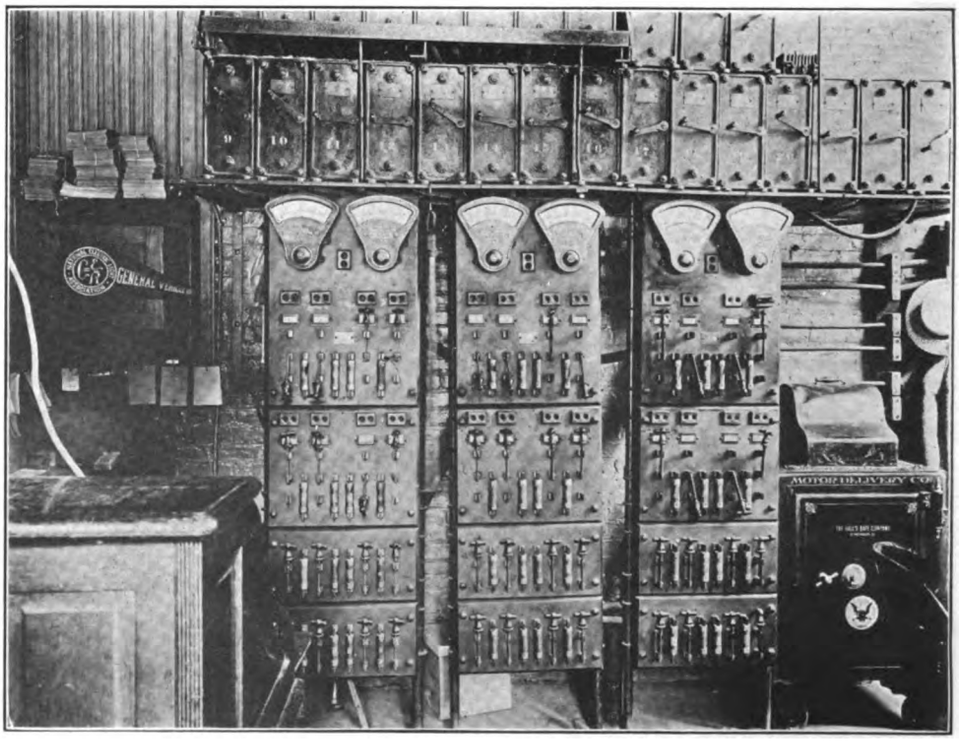
them in connection with animal wagons and determining from experience with a small number of units what changes from the old methods or system appear desirable. There are few concerns, even those controlled by men in every way conversant with and confident of the utility of the motor wagon, that have transformed their service from animals to power conveyances without a period of experimentation and as a rule the transition has been gradual.

As a matter of fact, it can be said that until comparatively recently there was even a disposition to wait and profit by the experience of those who were regarded as more venturesome. With large propositions, with a haulage expense aggregating hundreds of thousands of dollars annually, from five to eight years has not been considered too long a time to conduct investigation, and it is only within the past two years that there has been realization that the power wagon has the qualities and economies claimed for it. Today thousands of firms and businesses are experimenting along the line that has been specified, and there are a few that have been so satisfied with the results that they are doing all their work, and with a varying measure of profit and economy, with power vehicles.

Previous articles relative to the use of the electric wagons have demonstrated the facts stated. They have shown conclusively for certain work that these machines have been a distinct advantage—such qualities as justified their use, and this in metropolitan haulage, where the trips are slower than they might be under other circumstances because of traffic delays and obstructions. But in every instance these articles have been descriptive of lengthy trials, and where the initial installations were necessarily limited as to productiveness because of conditions for maintenance and care, and lack of practical knowledge precluded economies that were later realized.

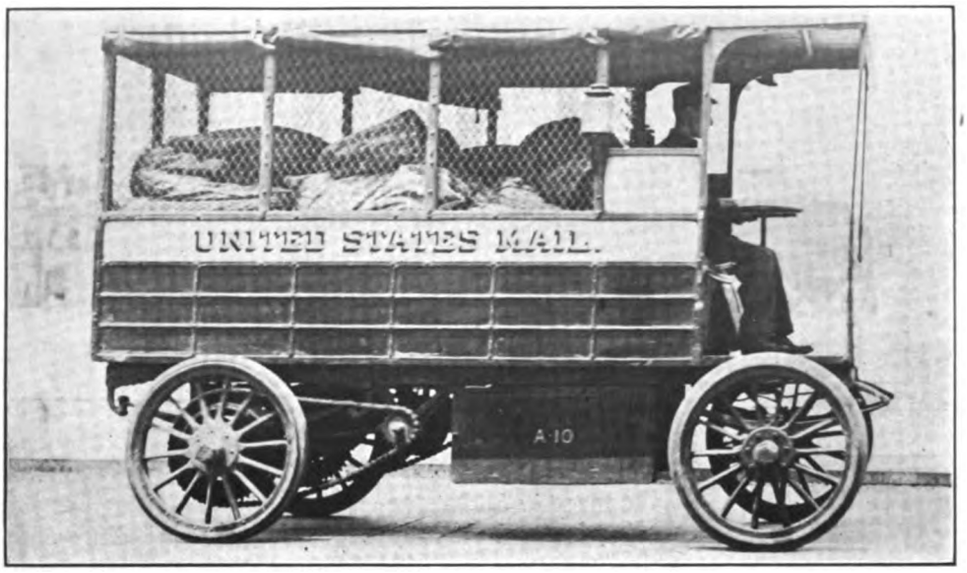
The foregoing is meant to impress upon the reader that the Motor Delivery Company, when it was organized, was probably the first concern in America to engage in business with electric vehicles exclusively, and probably the first to be created for engaging in a power wagon service where its earning capacity was limited and it would have to be so managed as to be profitable with a restricted revenue.

Now it should be understood that the United States Postoffice Department makes contract for transporting the mails. The work is defined by the postal officials and each contract is advertised and the public is invited to submit bids for what is specified. There is no restriction as to the number of contracts that may be bid for, but all else being equal the lowest compensation generally is the basis on which the contract is made. The specifications of the work set forth in detail exactly what must be undertaken, the minimum



The Charging Panel Located in the Office of the Motor Delivery Company, Convenient to the Records.

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General Vehicle 4000-Pound Electric Wagon, Used for Mail Transfer by the Motor Delivery Company.

volume of matter that must be carried, the number of trips that must be made, and other requirements. As government contracts have the merit of furnishing a constant and unfailing revenue, and there are none of the uncertainties that might be experienced in ordinary business, the fact that the income is limited, and perhaps comparatively small, is in a measure offset by an assurance of continuous work at a uniform price.

The experience of the postoffice department is that the volume of mail handled increases annually, and it is natural to expect that each year the work required will be more than for the preceding period. Just what provision is made for this increased haulage in the contract is not material, but the contract compels the contractor to carry whatever volume of mail is accumulated, in either direction. During certain periods of the year the mails are unusually large and this necessitates additional conveyances. This is particularly true of the holiday season and the first of the year, and at other times when there are occasions for more than normal correspondence. However, the work is more uniform than might be expected by those who are not well informed.

But in the government service the contractor has comparatively little discretion. The postal officials determine the number of routes, the schedule time for leaving from and arriving at the different sub-stations, and the manner of protecting the mail in transit. The contractor must furnish sufficient conveyances to meet any need that can be reasonably forecasted and he is required to make the trips at a regular rate of speed. This applies to each day the entire year. No matter what the temperature, whether the sun be stifling or the mercury below zero; whether the rain fall in torrents or the streets be hub deep with snow; whether the roadways be level asphalt or the paving be broken and rough; whether the traffic be light or heavy; whether the obstructions be many or few, the mail must be carried in the time allotted for the work or the contractor is immediately in difficulties.

Of course it sounds well enough to those who have had no experience with New York traffic to say that a reasonable time for the trip is allowed, but as this delivery or mail transfer is a part of the gigantic government system it must be a condition utterly beyond the control of the contractor that will be regarded as a valid excuse. By this is meant such delays as at an open drawbridge, blockade occasioned by an accident from which the driver could not extricate his machine, or a happening of like nature. A vehicular mishap is not to be considered. Of course there is this factor, that the contractor's vehicles have the right of way over all traffic, and there is a heavy penalty for those who wilfully or intentionally obstruct them, but the experience has been that there is none too much time allowed by the schedules, for moving through New York traffic is not like boulevard driving.

New York streets are notoriously bad so far as pav-



Three-and-a-Half-Ton Truck, the Largest General Vehicle Wagon in the Service of the Motor Delivery Company.

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10,000—11-1-11

MOTOR DELIVERY COMPANY

U. S. MAIL DRIVERS DAILY REPORT CARD

DRIVER'S NO. ..... DATE .....

VEHICLE NUMBER	BATTERY NUMBER	TIRE NUMBERS R. F	R. R	L. F	L. R	TIME OUT	TIME IN	ODOMETER START	ODOMETER FINISH	TOTAL MILES

DRIVER'S NAME ..... ADDRESS .....

Mail Driver's Daily Report, on Card for Filing, Four Inches Length and Six Inches Width, Printed on Both Sides.

ing is concerned. Undoubtedly the work is poorly done, although the cost is relatively high, but one reason that cannot be denied is that the roadways are constantly torn up and relaid because of differing underground constructions, and the paving will settle unevenly and, unless freshly asphalted, be so rough as to preclude a rapid pace of vehicle save at a corresponding ratio of vehicular deterioration. Then to maintain a schedule on such streets means a relatively greater degree of wear than would be experienced were the driver to drive as occasion should demand regarding maintenance economy. For instance, if the streets could be chosen and time taken to drive on them, the wear on the wagons might be materially lessened.

The Motor Delivery Company was organized to transport mail and it bought a horse service that had the contract for the work. This brought the company to a horse basis so far as the price paid was concerned, and there can be no change until the contract has expired and another entered into. This necessitated initial expenses that have to be considered in the accounting, for a garage was built in Lawrence street, Harlem, this being a single-story brick structure that has a capacity of about 40 machines. It might be practical later on to add a story or two to this, but there is no basement. There is no income from the building, and the cost of the garage to the company is more than were it larger and part rented and a revenue received from tenants, although the capital required would no doubt be greater.

When the garage was built the company took up the contract work with 22 General Vehicle Company electric wagons, these being of 1000, 2000, 4000 and 7000 pounds capacity, and because of uncertainty as to what might be required it was believed that some garage business might be developed. Accordingly a gasoline tank was installed and a series of steel lockers intended for the use of the owners and drivers of customers, set up, but it was found that it would not be practical to take any volume of outside patronage and what might have been developed as a public service station business has been devoted practically to attention to the vehicles which have been found necessary to carry out the company's contract.

Now the company has 28 electric wagons, which are of the following capacities: Seventeen of 1000 pounds, five of 2000 pounds, four of 4000 pounds and two of 7000 pounds, all of which are fitted with two body types, the 1000-pound wagons being equipped with what are known as convex full panel bodies, with front corner posts, and the others having express bodies with standing tops, with the sides protected by heavy wire screen and side curtains that may be dropped in the event of storm. The larger wagons are fitted so that the drivers are protected by storm fronts in the event of rain or snow.

The service of the company goes on day and night, although the greater part of the haulage is done during the day and up to midnight, but there are wagons on the streets practically all the time. It is not possible to give the work of one machine as being representative, for there is a wide difference in requirements, but the daily mileage is approximately 1000, with mileages of approximately 666 and 500 for holidays and Sundays. This, allowing for nine holidays and 52 Sundays each year and 304 business days, aggregates 336,000 miles annually, or 12,000 miles for each wagon. This would allow an average of 32.9 miles daily for each machine, but as there are the lessened mileages of Sundays and holidays to be considered, and the fact that the larger wagons are not used regularly, it will be seen that the average of each vehicle will closely approach 40 miles daily. In fact, some of them will somewhat exceed 40 miles, as will be shown presently.

Now it is evident that if a schedule is allowed for each trip, and this must be maintained as closely as is possible, there must be an excess or reserve equipment, and what is required is represented by the 28 wagons. The 1000-pound wagon is found to be especially serviceable because the loads are not large, but the trips must be made frequently, and to operate larger wagons would be unprofitable. The problem is to employ the sizes which will best serve the purposes and be the most economical. When the needs increase it is best to employ wagons of greater capacity where this can be done, and so the 7000-pound wagons are distinctly useful when the haulage is very heavy.

But the wagons at work must be worked unless it is impossible to do so. If a machine becomes disabled

REMARKS

TOTAL HOURS IN SERVICE ..... CORRECT

FOREMAN

Reverse of Card for Mail Driver's Daily Report.

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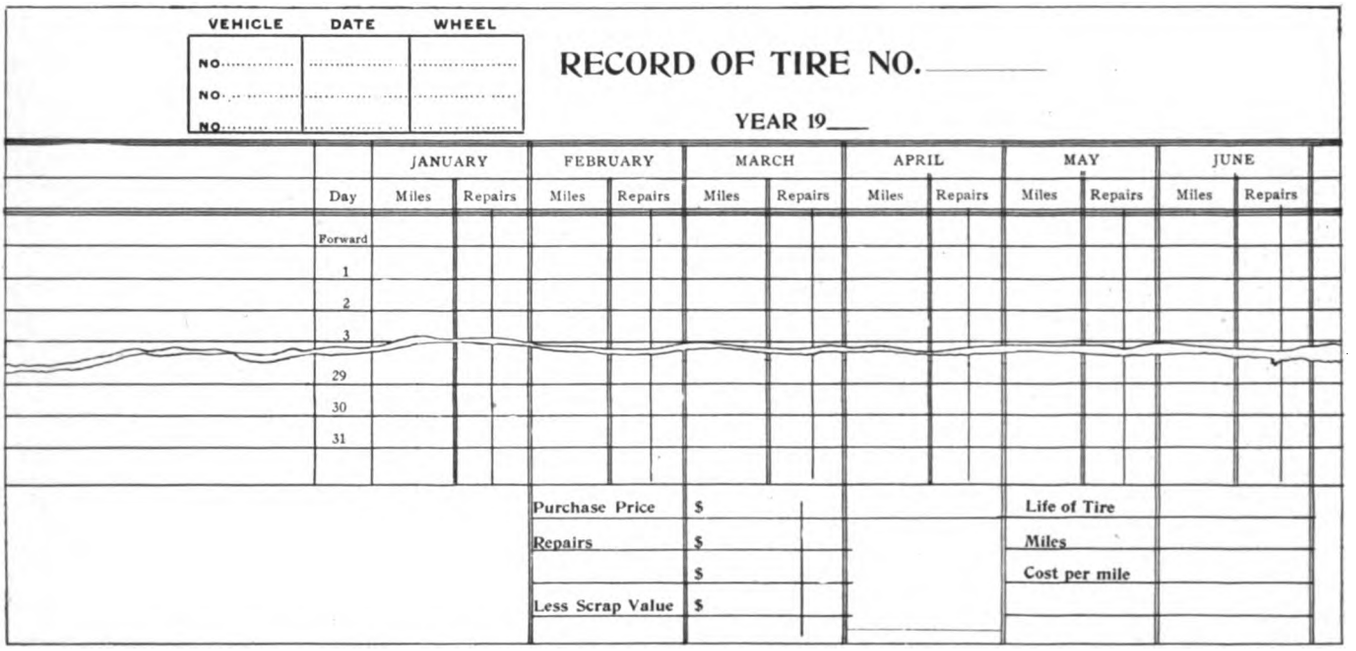
the garage is notified and a spare wagon is sent to the point where it is wanted, the mail transferred and the trip continued, and if a repair or an adjustment is required the wagon is kept moving to schedule until it is relieved. If a tire is shed the wagon is stopped only to call the garage and ask for a relief wagon to meet it along the route, and it continues on the rim until the load is transferred, when it is sent back to the garage for repair and a new shoe. There must be no waits and no stops if these can be avoided, because there is always possibility of delay and the need of all the time available to keep up to the schedule.

Because of the possibility of demands for the machines in the garage at any time those not in service are kept with the batteries as near full charge as can be done, and so there is seldom a period in the day when some of the wagons are not being "boosted," while repair work is also in progress much of the time. Each wagon is worked as much as is practicable and

ods the wagons must be changed oftener and the batteries must be charged systematically. While there are excuses possible for all other classes of traffic the mail must not be delayed and the responsibility falls upon the management for every second that is lost.

It should be stated that the company has a considerably larger mileage to serve than was provided for in the original contract, this because of the elimination of some of the means of transportation, principally trolley mail cars, and the elevated road trains. Various conditions brought about the need of changes and the most practical solution of the problem was by adding these routes to those covered by the Motor Delivery Company's contract.

No doubt the reader has inferred that there was considerable uncertainty in the first year's service as to just what could be accomplished and it might be said the work was more or less experimental. It was found that six additional wagons were necessary and



Form of Daily Record: These Sheets Are Kept for Vehicle, Tire and Battery Accounting and Each Will Contain a Year's Mileage and the Maintenance Expense. They Are Arranged for Loose Leaf Binding.

each driver has a route that he must cover. For instance, one man's work means that he must make nine trips, each of seven miles, this making a total of 63 miles, which is done with two wagons, one of which must be driven 28 miles and the other 35 miles. Another man has a route with a total drive of 76 miles in three wagons, and another must drive 73. The trips range from 9.5 to 19 miles for the round trip.

The wagons are kept up to the schedule and the consumption of current is economized so far as this may be done, but in the winter, when the snow is four or more inches in depth, it is found that the mileage is decreased materially, this being due to the fact that the snow is swept from the car tracks into the roadways and from the sidewalks into the street, increasing the depth for the time being so that all traffic is impeded. While such conditions do not continue for more than two or three days at the most, during these peri-

they were added, and this precluded any material revenue from garage service. Besides, it was necessary to devote a section of the floor to the battery department. That there shall be no delay from accident or failure of batteries several spare installations are kept, and these are used as often as is necessary to maintain efficiency, so that charging and testing of batteries as well as repair and maintenance of cells is an important and constant work. The moment a battery loses capacity in any manner it is removed from the wagon and another substituted, so with the use that is given a mileage of from 10,000 to 11,000 can be depended on, and a battery will serve from 10 to 11 months as an average. It is understood, of course, that lead batteries are used with the wagons. The batteries are given good care and are flushed frequently and equalized regularly, being tested carefully for possible causes for deterioration. As it is necesary to "boost"

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the batteries, especially with the smaller wagons, there is perhaps a slightly lessened life than were the charges and discharges to the capacity. While the battery department is merely a section of the garage floor, it has the advantage of being well lighted and there is sufficient space for any work that may be necessary.

The charging board, which has a capacity for 24 vehicles, is located in the office of the company, and it is an excellent equipment, although the apartment is decidedly limited for space. Here, however, it is under the observation of the foreman and the manager, and the records may be conveniently kept. These are the advantages of the location.

The system of accounting for the service is extremely practical and complete. Nothing that is desirable is lost sight of and every record is well maintained. The charging form is simple, being designed to have sufficient entries for every charge given at the station, no matter the number daily, giving the identification number of the vehicle, the time when charging was begun and the amperage and voltage readings, and the time when charging was concluded and the amperage and voltage readings, together with the check. Each day's sheet is preserved in a file. From this sheet a note is made of the current used for each charge. This is credited to the vehicle.

The garage organization includes a foreman, two repairmen, a battery man and an assistant, and a "combination" man, so-called, who can assist in whatever work he is called upon to do. Because of the nature of the work for which the wagons are used the repairing must be done whenever the conditions will permit, and provision must be made for any exigency that may arise. As the repairing is systematized the first report is made by the driver, who is required to fill in a card giving his number and the date, and then is entered the number of the vehicle, the number of the battery, the number of each of the four tires, the time of starting and the time of returning, the readings of the odometer at start and finish of the day's work, and the total number of miles travelled. To this the driver subscribes his name and gives his address. On the reverse of this card is a lined space for a report under the head of "remarks," and at the foot is a blank for entering the number of hours in service. This card is presented to the foreman, who certifies that the report is correct, which requires that it be verified by him, and on the basis of this report any repair or adjustment is ordered.

A time card is made out by the foreman and the work is performed by the mechanics or the battery men, and for any parts or supplies needed requisitions are made out by the foreman. These requisitions are in turn charged to the vehicle by number. The parts are accounted for at the cost price to the company and the supplies are similarly charged. The labor is apportioned on the basis of a standard rate an hour.

Three daily records are kept, each of which is in

VEHICLE INSPECTION REPORT.

Date,.....

Vehicle No.....

CONTROLLER
- Are fingers in good condition and making contact.....
- Are contacts in good condition.....
- Are all connections tight.....
- Were contacts wiped with vaseline cloth.....
- Are all bolts, nuts and screws in place and tight.....
- Is cut-out switch in good condition.....
- Are snap switches in working order.....

STEERING GEAR
- Are sector and pinion in good condition.....
- Is steering lever tight.....
- Did you oil lower steering post bracket bearing.....
- Was sufficient grease in cup for steering head pin.....
- Is one turn given this grease cup cap daily.....
- Has upper steering post been oiled daily.....
- Did you oil double bearing under floor.....
- Is bell in working order.....

MOTOR
- What date was motor packed with non-fluid oil.....
- Are commutator and brushes in good condition.....
- Are nuts on motor radius rod tight.....
- Are motor leads in good condition.....

AXLE AND SPRINGS
- Are springs in good condition.....
- Are spring clips tight.....
- Are spring bolts oiled twice a week.....
- Are axles in good shape.....
- Are spring hanger rivets tight.....
- Are all frame rivets tight .....

WHEELS
- Are all spokes sound.....
- What is general condition of wheels.....
- What date were wheel bearings packed with non-fluid oil.....
- Are chain spockets on rear wheels in good condition.....
- Do front wheels line up properly.....

COUNTERSHAFT
- Are countershaft sprockets in good condition.....
- Are Morse gear and chain in good condition.....
- Is Morse chain lubricated twice a week.....
- Is Morse chain cleaned monthly.....
- Is Morse chain properly adjusted.....
- Are countershaft bearings packed with non-fluid oil every three months.....
- Are roller chains cleaned in gas and soaked in heavy oil every two weeks.....
- Are roller chains properly adjusted.....
- Are nuts on radius rods, connecting rear axle to countershaft, tight.....

BRAKES
- Are brakes properly adjusted and in good working order.....
- Are all connections properly oiled.....
- What is condition of brake band lining.....
- Are brake band pins and toggles in good condition.....

TIRES
- Are all tires in good condition considering the distance they have travelled.....

BODY
- Is all woodwork in perfect condition.....
- If not, what is wrong.....
- Are wire screens in perfect condition.....
- If not, state what is out of order.....
- Are all four lamps in good condition and working.....
- If vestibuled, what is condition of weather shield.....
- What is condition of curtains.....
- What is condition of boot.....
- Does roof leak.....
- If Mail wagons, are locks O. K.....
- Is State License on vehicle, both front and rear.....
- What is condition of paint and lettering.....
- What suggestions to improve appearance.....

.....Inspector.

Vehicle Inspector's Report,, Printed in Black on Both Sides of White Paper, 12 Inches Length and Nine Inches Width.

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the form of a loose leaf sheet, which is kept in a binder. The one is that of the vehicle, and this gives the number of miles driven and the cost of repairs for each day of the year, the monthly mileage and the repair charge being carried forward each month. At the close of any given day this record will show the daily items and the total for the year. On this record is carried the purchase price, and this is depreciated on a basis of 10 per cent. annually. Either side of the leaf carries a record for six months, and a summary.

The second record is of each battery, because batteries are changed from one vehicle to the other, and while one battery might be in one machine for several months it may do service in a half-dozen or more during its period of usefulness. The record of each battery, like that of the vehicle, is by day, and mileage driven and the cost of repair is charged. It will be seen that a battery is regarded as having a certain approximate life, and it is expected that this will be realized by the exercise of good judgment.

The third record is of each tire, and a specimen page of this is shown. The three daily records are practically alike, aside from the headings, which are identified by the terms "vehicle," "battery" and "tire." The battery and tire records show the purchase prices and when no longer useful the repair cost may be added. From this is deducted the estimated value for scrap. Then the length of time of service, and the number of miles driven or operated are entered, and the cost a mile is the final figure.

It will be noted that the vehicle mileage, the battery number, the individual tire numbers, and the total mileage for each, is taken from the report of the driver, which has been verified by the foreman. The requisitions for parts and supplies and time cards for labor supply the repair cost for each record. A further record of the motor and battery labor is kept, and by this it is possible to differentiate each character of cost.

Of course when a change of a tire or a battery is made this fact is noted in the report of the driver and the foreman, which makes it possible to follow the work accomplished with each.

The question may be asked: What is the value of this information? It will be seen that it is practical to ascertain whether or not the tires, batteries or vehicles are giving the mileage expected of them, and to learn the reason for increased cost of any kind. To illustrate, the statement for the second year of service for the company showed the following:

Vehicle Capacity	Tire Cost a Mile	Battery Cost a Mile	Repairs Cost a Mile	Motor and Battery Cost a Mile
1000 pounds....	$.0095	$.0172	$.0147	$.0086
2000 pounds....	.0172	.0328	.0130	.0089
4000 pounds....	.0195	.0217	.0094	.0101

This was based on a mileage of 14,557 for the 1000-pound wagon, a mileage of 14,269 for the 2000-pound wagon, and a mileage of 10,742 for the 4000-pound wagon. These figures reduced to a basis of 10 years' service showed that the cost was considerably less than had been estimated by the maker of the wagons, the General Vehicle Company, for average cost. The estimate of the General Vehicle Company is that the cost for tires, batteries and all replacement charges, without computing garage labor, is 22.17, 25.40 and 22.98 per cent. of the total operating expense for 1000, 2000 and 4000-pound wagons, respectively.

The showing of the Motor Delivery Company is the more creditable when it is understood that the General Vehicle estimate is based on 10,500 miles a year for 1000-pound wagons, 10,140 miles a year for 2000-pound wagons, and 9390 miles a year for 4000-pound wagons. It is understood that all things being equal the vehicle used the more ought to show a relatively greater repair expense, and with this company the machines show that the tire cost is decidedly low, especially when it is known that the machines are driven generally faster than the movement of the traffic, and over streets that are notoriously severe on rubber shoes.

The vehicles are not particularly striking so far as paint and varnish is concerned, because in daily service they show the effects of frequent washings and constant usage, yet they are amply protected from the weather and given good care. The best illustration of the attention given to them is by the reproduction of a report blank, which is filled in whenever an inspection is made. The nature of the examination is best understood by study of the form, for the inspector is required to not only investigate thoroughly all the mechanism, but to state facts relative to manner and frequency of lubricating, the condition of different parts, and after specifying in detail must suggest what will improve appearance.

Nothing whatever is neglected. The inspector goes through the controller, the steering gear, the motor, the axles and springs, the wheels, the countershaft, the brakes, the tires and the body, the only equipment not being reported upon being the battery, which is expected to be tested whenever necessary in the judgment of the foreman or the manager.

As might be assumed these inspection reports are filed and referred to as occasion demands, and they serve a particularly useful purpose in tracing any condition or defect. The records are systematically made and maintained, and they have been found to be of unusual value. When tire cost can be determined to a thousandth of a cent a mile; when the expense of the vehicle as a whole, or the batteries can be similarly accounted, it is both possible and practical to find every character of waste or leakage and to apply whatever is necessary or desirable to economize. There are certain fixed charges, such as amortization, interest, fire and liability insurance, electric power, rent, light, heat, water, taxes, garage labor, and driver's wages, which represent from 75 to 79 per cent. of the total cost of operation, which must be accounted for with other forms and by other methods, but these items are generally provided for with the majority of systems, and these cannot be regarded as within the scope of methods that have to do with the actual use, maintenance and care of the machines.

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EXCLUSIVE ELECTRIC WAGON GARAGE.

New York Public Service Station That Produces Its Own Current by a Gas Plant and Gas Engines and Generators, Selling Its Surplus Energy at a Profit.

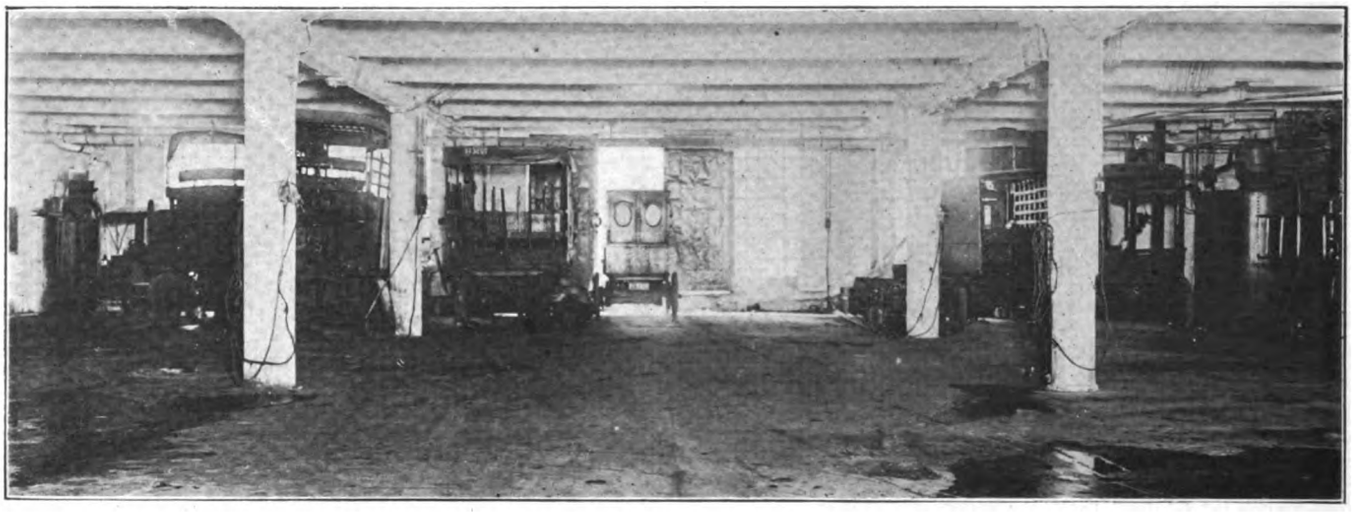
THERE are few service stations throughout the country devoted exclusively to electric vehicles, fewer still that give attention solely to power wagons of this type, and with but one or two exceptions these establishments depend upon the public service corporations for current for power, lighting and charging. One of the stations that produces its own electric energy is the Acme Electric Garage, at 410 East 32nd street, New York City.

There are more than 25,000 enterprises in the United States that produce current for light and power purposes, and each of these has a maximum production. As a business proposition each corporation seeks to sell all of the energy generated, because few of them have any means for conserving the current, and it cannot be profitably stored and used. Power requirements necessitate the operation of the plants by day and lighting demands a large part, if not a similar volume of current, for a portion of the night, so there are periods during the 24 hours when it is necessary to curtail production or waste what is produced.

Under any circumstances, no matter how closely the demand approaches the capaciy of the generating station, there are times when the business requirements are comparatively small, such as from late in the evening until early in the morning, during Sundays, holidays, and other times when manufacturing plants are idle. Theoretically the greatest economy in production would be operation to capacity constantly, and whenever there is diminution of the use there is relatively an increase of cost for the interval, whatever it may be.

The usual custom is for the service station to purchase its power at the regular commercial rate, which is by a scale by which the price is lessened as the current consumed is increased, and the cost to the owners of electric vehicles is ordinarily fixed at a flat rate, a customary charge being four cents a kilowatt in cities of reasonable proportions. The garage will use whatever current is necessary, and the demand may vary somewhat, the variance depending upon the service given by the machines.

There are numerous plants and buildings that have individual lighting installations, and some of them produce power, but practically all of these consume their own energy. Electric generators are not uncommon, and frequently these may be found in garages of even moderate capacities, but these are not often used for anything else than the lighting, although occasionally they may be utilized for furnishing power for the operation of small machine tools.



The Storage Space of the Acme Electric Garage, 410 East 32nd Street, New York City, with the Vehicles Out at Service.

The Acme Electric Garage is notable from the fact that it is of considerable proportions and it generates all its own electrical power, using a gas producer plant to make fuel for the gas engines that drive the generators. The station serves approximately 60 service wagons, and this is all that can be accommodated with the floor space that is available. There are times when it is necessary to leave a few of the machines in the street to have space for shifting and locating the others, so that the station is really crowded beyond what might be regarded as the capacity.

Much is dependent upon the location of any business, especially a public station for power wagons, because of innumerable reasons, chief of which is convenience to the owners. Assumedly the nearer a garage is to prospective patrons the more probability of patronage, all else being equal. It is rather surprising to find that the two exclusive electric service vehicle garages are both in the East Side of New York and within seven blocks of each other when the distance is measured as between streets.

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That the station is given over wholly to electric service wagons is in itself a sufficient reason for the enterprise to receive special attention, and that all the current consumed is produced by the power plant is equally deserving of inquiry, but added to this is the gas producer that furnishes fuel for the motors, an equipment that has been found to be exceedingly economical.

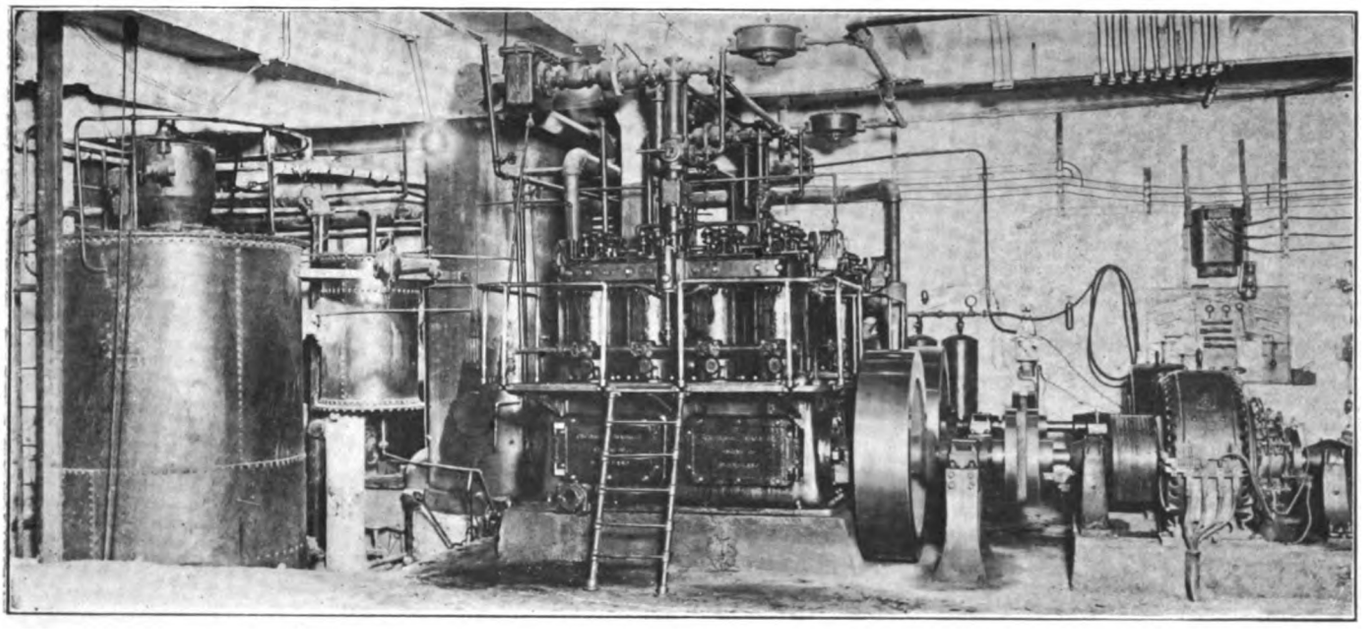
The Acme Electric Garage was established three years ago last spring by William G. Illch, an electrical engineer who had a training in broadly differing works and with electric vehicles. He believed there were possibilities with a station of this character and after investigation opened a station at 37th street and Seventh avenue, where he sought to give a general service for industrial wagons. He solicited customers and secured a considerable number, though at that time the ratio of electrics in use was very much smaller than now.

Mr. Illch's plan for care and attention includes storage, oiling and greasing daily, washing, polishing, minor adjustments of the machines, flushing and equalizing the batteries, and supplying current. For this he established a fixed price instead of according to capacity and the real basis being the size of the batteries and the consumption of energy. Aside from this stated service the work performed was regarded as extra and charged for at the usual price for labor, with the additional cost of the parts or supplies used.

About a year later the garage was removed to the building in East 32nd street and this provided additional space for storage. The entire ground floor is occupied and there is an area of approximately 20,000 square feet. A small part of this is utilized for an office, and the remainder is open and clear, several sections being given over to mechanical and battery work and the gas producer and power plant.

The first year Mr. Illch made contract with his customers on a basis of $30 a month for service, but this was found to be a losing proposition because of the demands for current, and the belief of some customers that it was well to utilize the vehicles as much as possible where there was no difference to them in cost whether or not they consumed much or little current. Naturally the more the machines were worked the more energy was required.

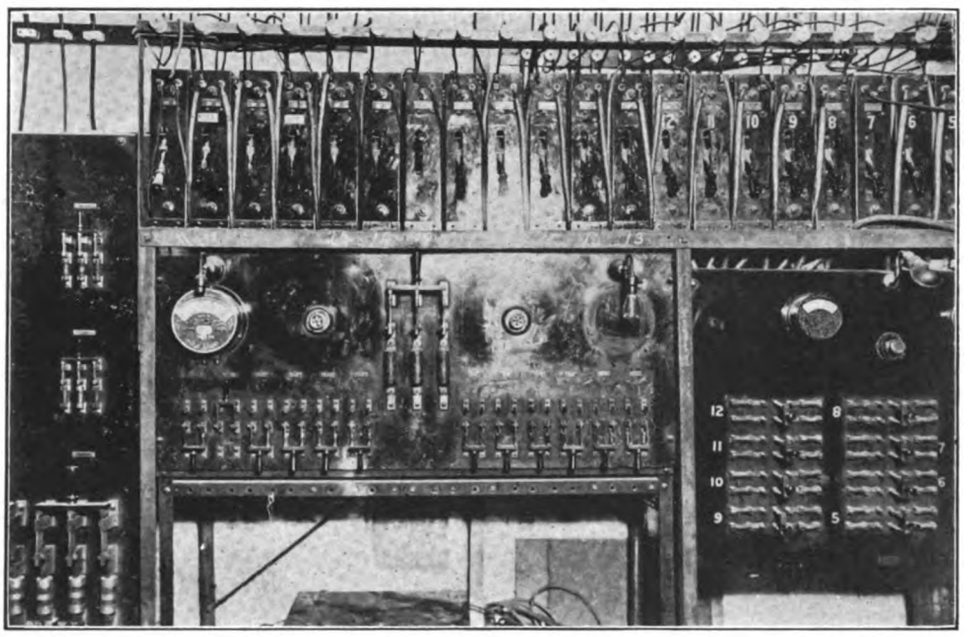
After making the change of location Mr. Illch turned his attention to the current problem. He concluded that if he were to produce electrical energy at the greatest economy it would be necessary to find a sale for the energy available when it was not needed in the garage. This brought about investigation of conditions and a proposal to furnish lighting and power for the building in which the garage is established. The structure is devoted to manufacturing and power is needed to drive the machines and to operate the elevators, and while the lighting demands are practically the same as in any other manufacturing building, Mr. Illch found he could supply the building and its tenants, provided he could have a thoroughly dependable service, and that this would require a plant of considerable proportions. As this current would be necessary during working hours six days a week and there would be some slight demands during Sundays and holidays, and his garage requirements would be principally during the nights of the working days of the year, he made his estimates and then visited engine builders and submitted to them his proposition.



The Gas Producer, Gas Tank, Two 75 Horsepower Gas Engines and Two Electric Generators That Produce 2000 Kilowatts Daily at a Coal Consumption of 2500 Pounds.

The result was the ordering of a mechanical plant that cost approximately $20,000 installed, this including a gas producer, two 75 horsepower engines, and two electric current generators. This was installed in a corner of the garage, and it was first placed in operation April 1, 1911. The purpose was to make the plant as well nigh automatic as is possible, and it is said by Mr. Illch that the attention necessary is given daily in about two hours by a single man, so that the labor

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A Section of the Charging Board of the Acme Electric Garage, Which Has a Capacity for 24 Machines at Once.

expense is practically negligible. The plant produces about 2000 kilowatts each 24 hours at cost of .2 cent a kilowatt for oil and fuel, and the other expenses bring the total cost for production up to .8 cent a kilowatt.

The plant consists of a retort into which the No. 1 buckwheat coal is fed automatically by gravity. The gas generated is purified and carried to a tank where it is cooled and utilized to energize the motors. The engines were built by the Bruse-McBeth Engine Company, Cleveland, O., these being a heavy duty type, water-cooled, four-stroke cycle, having four cylinders each with 11-inch bore and 12-inch stroke, developing 75 horsepower at 310 revolutions a minute. Each engine is fitted with two magnetos to insure against ignition failure and coupled to each engine is a generator. The engines are started by compressed air. Each engine is operated 23 hours daily, one being stopped for an hour between 6 and 7 the evening of each day, and the other between the same hours in the morning, during which stoppage they are given whatever attention is necessary.

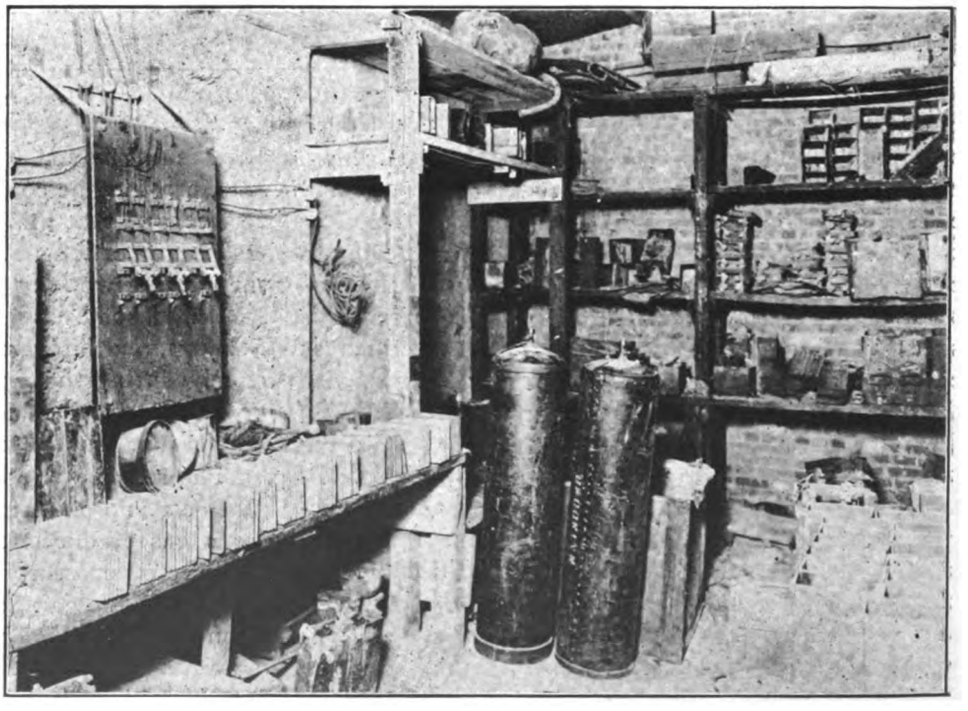
The other hours both are in operation, and are ordinarily driven to capacity. The coal consumption is 2500 pounds daily, the cost being $3.50 a ton delivered at the garage. Being well silenced there is practically no noise and the engines, when the gas supply and the ignition have been adjusted, will continue work for indefinite periods. The plant is not small, and yet from the accompanying illustration it will be seen that it is compactly installed. The heat from the producer is not excessive.

The results with the gas producer and the power plant have been so satisfactory that Mr. Illch intends to add another 75 horsepower motor and generator to the installation, which will make the third unit and will afford 225 horsepower when all three are in operation, the demands for current being such as to justify this increase of capacity.

The garage is conducted as a service station for contract customers, practically all of the business being attention to vehicles that are served on a monthly basis. The established rate for each vehicle of the following capacities is as follows:

Load Capacity	Monthly Service Rate
750 pounds	$35
1,000 pounds	40
2,000 pounds	40
3,000 pounds	45
4,000 pounds	50
6,000 pounds	50
7,000 pounds	50
10,000 pounds	55

For the prices stated the vehicles are stored, washed and polished daily, oiled and greased daily, whatever adjustments are necessary are made daily, the batteries flushed and equalized whenever this work



The Battery Repairing Department of the Acme Electric Garage, Showing the Stock of Materials and Facilities for Work.

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№ 400 **SHOP TICKET**

ACME ELECTRIC GARAGE
410 EAST 32D STREET

MECHANICAL
BATTERY NEW YORK, ... 191

Work to be done on _____

To be completed _____

Time and Material used _____

_____

_____

Remarks _____

_____

Signed _____

Shop Ticket of the Acme Electric Garage, Padded for Triplicate Entries, of White, Yellow and Pink Paper, 5.25 Inches Length and Eight Width, Perforated for Separation from the Pad.

is desirable. As the machines are generally in use during the day the greater part of the work is performed at night and during days when they are not worked, so that the majority of the employees are included in the night shift, which is directed by the night foreman.

The machines are taken out at different hours in the morning, some of them very early, and usually they are returned in about the order in which they leave. They are occasionally left just outside the garage because of the limited floor space and are brought in and washed, after which they are placed in their different bays and immediately placed on charge. Each car is given a hasty inspection as it is brought into the garage, its general operation being noted in the handling and examination being made of any conditions to which attention is directed. The drivers are required to make report of whatever in their judgment is needed to maintain efficiency or any adjustment that is necessary.

When a vehicle is washed and placed on charge necessary work is begun. Occasionally the washers may discover the need of an adjustment or repair, and report is made to the foreman. If the condition requires work in addition to the regular attention this is ordered under the instruction or authority of the driver or owner, a record of which is made. Some owners authorize their drivers to order work, some reserve this right to themselves, and others give discretionary authority to the management of the garage or the foremen. As a rule considerable depends upon the requirements to keep the machines in operation, and an emergency work may be ordered without authorization if the service could be uninterrupted. Or perhaps a temporary repair is made and the driver or owner notified as soon as they can be conveniently reached. As might be assumed there are many situations that cannot be forecasted and where exercise of judgment is imperative. Of course it is essential that there be no loss of service, for the garage management is responsible for the condition of the vehicles.

Each month, or rather at intervals of approximately 30 days, careful inspections of the machines are made and detailed reports prepared that are sent to the owners. These reports are the basis for statements as to the cost of parts and estimates of the probable labor needed and cover everything up to a general overhaul or a battery renewal. One of the most important details is the condition of the batteries, and these are equalized once a month as an average, and are flushed whenever experience justifies this attention. The batteries are attended by an electrician of expert knowledge with them, and repair work of all kinds is undertaken. Several of the machines are used with spare batteries and practically all the time battery work is in progress.

With relation to the repairing and restoration, when spares are required it is expected that the owner will have at his disposal such parts as may be from time to time required, because it is desirable to order these and have them in readiness rather than take the chance of having the machines idle in the event of need. So far as possible stock is carried with which service may be maintained until a factory order may be filled and restoration made. This applies to vehicle, motor, controller and battery components. The repair department is equipped with tools sufficient for any reasonable number of workers, but special work may be procured outside rather than installing machine tools for which there is but occasional use.

The regular attendance to each vehicle is shown by the charging sheet, so far as current supplied is concerned. The report of the driver to the foreman, the brief test, the examination by the washer, and the washing, is followed by the charging, and if the work

No ..... Date _____ 191

ACME ELECTRIC GARAGE
Charging Report

By _____

Vehicle	Battery		Max'm Char'ng Amp's	Open Circuit Volts	Plug No.	Beginning of Charge			End of Charge			Acid Read'g	Odometer Read'g	Remarks
	Cells	Plates				Time	Amp's	Volts	Time	Amp's	Volts			

Acme Electric Garage Charging Report, Printed on Paper Ruled for 40 Entries, 11 Inches Length and 8.5 Inches Width.

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in the way of adjustment is included within the contract no record of it is made. If there is a part or supply used the extra work is included in the shop ticket made out for the job. The shop ticket is self-explanatory. It specifies either mechanical or battery work, the identity of the machine, when the work is to be completed, and the material used. The ticket is made out and on it is written whatever direction or comment is desirable. The ticket is signed by the authority for the order.

This shop ticket is made in triplicate, the white sheet being the original, the yellow and pink sheets being the first and second copies, respectively. The original is given by the foreman to the mechanic who will do the work. This ticket is the authority for the requisitions for the material and supplies for the job and these requisitions are charged by ticket number and to the name of the owner of the vehicle. The first copy is placed on a hook on the desk of the bookkeeper and serves as a means for checking the original and the requisitions. The second copy is used as a record



Detroit 1000-Pound Electric Delivery Wagon in the Service of the Croninger Packing Company, Shamokin, Penn.

and is sent with the bill to the owner. The labor is indicated by the time card and the total is charged on the original at the completion of the work.

Where the work is of a character to require a number of items of materials and supplies these are made out in list form and attached to the shop ticket, which in its general form is a summary. Obviously these tickets may be applied to practically everything that is undertaken in the garage, and, from them, when supplemented by the requisitions and time cards, every detail is cared for.

The charging record is more detailed than the usual form, this requiring the vehicle by number or other identification, the number of cells and number of plates to each cell of the battery, the maximum charging amperage, the open circuit voltage, the number of the charging plug, the time, the amperage and the voltage at the beginning and closing of the charge, the acid reading, the odometer reading and remarks, if any. It will be seen that to fill the report requires a knowledge of facts that can only be learned by actual examination, and there is no chance for an error to go undetected. The station has 36 charging plugs.

Of the electric wagons in use the majority of them are intended for heavy service, about 30 per cent. of the total being designated as small. Several of the trucks, three 3.5-ton machines to be specific, are cared for at the garage under a regular maintenance contract, which provides for every attention, including repair work of all kinds, tires, painting, and the like. With these it is necessary to keep a record that would be similar to what would be employed by an owner, in addition to the usual contract accounting. The success of this form of contract has not been sufficiently determined to justify a statement on the prices charged for each vehicle.

The character of the garage and the generating plant attracts many visitors daily, and the installation is frequently examined by electrical engineers.

PACKING HOUSE ELECTRIC DELIVERY.

For more than a year the Croninger Packing Company at Shamokin, Penn., has used a 1000-pound Detroit electric delivery wagon, made by the Anderson Electric Car Company, Detroit, Mich., in its service with decided success. The work is haulage to and from the railroad freight stations, as well as delivering a considerable volume of orders. This machine is a standard type with a water proof fabric cover that gives protection to the load and sufficiently shelters the driver, having also the merit of lightness. The company regards the electric as ideal for the work this wagon has to do because of the cleanliness and absence of odors that might contaminate the meats carried. This wagon is equipped with a 60 type A-6 cells Edison battery. The current is supplied from a generator operated at the company's plant and the cost of energy is comparatively low. When the wagon was placed in service the driver was selected from men who had long been in the employ of the company and he carefully maintains it. The wagon accomplishes a very large volume of work and has always been found dependable and economical.

TESTING ELECTRIC TRUCKS.

Speaking of the testing of electric trucks, J. M. Lansden, manager of the electrical division of the General Motors Truck Company, Detroit, lays claim to the fact that the task is no easy matter. After the truck is assembled it is given its preliminary road test. This is done for the purpose of noticing the relationship of one part to another, and to see if the truck runs smoothly and is otherwise correct mechanically. After this comes the most important trial, that of ascertaining the power capacity. To make sure of this the General Motors Truck Company overloads each truck 50 per cent. and with this extra weight the truck negotiates 75 miles.

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VEHICLE TRANSPORTATION RESEARCH.

THE first investigation of highway transportation by an educational institution with a view to determining economic possibilities is now progressing under the direction of the electrical engineering department of the Massachusetts Institute of Technology at Boston, and the direct supervision of Prof. Harold Pender. Much of the investigating for the past year has been by H. F. Thompson of the department, and information has been obtained in Boston, Buffalo, Chicago, Dayton, O.; New York City and Rochester, N. Y.; St. Louis, Mo.; Washington, D. C.; Pittsfield, Mass., and other cities. The first comparative information resultant from the compilation of the data gathered has been presented in a preliminary report, which is designated as Vehicle Research Bulletin No. 1.

The systematic study of the work accomplished and the cost of maintenance of horse, electric and gasoline wagons was made possible through a fund placed at the disposal of the institution by the Edison Electric Illuminating Company of Boston, and, with a realization of the value of the reports to the industrial and commercial world, the investigation was organized as carefully as was possible without precise knowledge of what might be developed by inquiry.

The first statement made is decidedly worth the attention of every man engaged in business, no matter what his need of haulage. It is necessarily brief, its findings are incomplete, and there is absence of facts that might accentuate the determinations, but even a casual examination of the report deeply impresses upon the reader the absolute necessity of systematic and perfected accounting of transportation expense. As a matter of fact, it would appear that there are unlimited possibilities for systematizing haulage to bring about the fullest measure of economies, and the Massachusetts Institute of Technology through its research of vehicular transportation has inaugurated an education that is absolutely necessary, and which until now has been neglected.

Like every inquiry having economy as its purpose the work has progressed slowly. This has been due to the inability to obtain anything like uniform data from the concerns willing to supply whatever information was possessed, and only from 11 of the 54 individuals and corporations covered by the report were facts forthcoming. Of the remaining 43 concerns, 21 promised to furnish data later on, and from 15 others no facts were obtainable. The bulletin deals with these 11 instances and with the observations making with the vehicles of nine different firms in Boston.

Emphasis is made of the difficulty of securing anything like reliable facts, and it is to be further commented that there is the widest difference in those that have been obtained. This condition obviates the direct comparisons that are really essential to precise determinations, and this brings directly to the attention of the business man the imperative need of uniformity in accounting. It is hardly necessary to expatiate upon the value of comparisons. Today the measure of service and cost is by animal transportation, two factors that are so uncertain as to be worthless, and are so variable as to be untrustworthy unless the standard is the usual market price for rented service, an exceedingly unreliable basis.

In making the investigation forms have been prepared which appear to be well suited to the requirements, and detail in the form of figures is supplied so far as this may be done. In the report these figures are submitted in the form of summaries. Some of these, however, deal with the same type of vehicles in the service of the same organization, yet these are for differing services and must be further analyzed before the relative expense and work can be understood, even on a monthly basis. The summaries for the electric and gasoline machines are as nearly alike as is possible to have them. The majority of the wagons is electric, and it is apparent that the owners of that form of vehicle have given more careful and systematic attention to their service accounting than those owning other forms.

The electric summary gives the capacity of the vehicle, the number of the company, the business, service, period of data, number of trucks averaged, truck cost, truck age, company's number and type of battery, under the head of general; the number of miles, kilowatt-hours, days used, days out of commission, trips, stops and weight of loads are under the heading of annual performance; and under the head of animal expense are three groups, the first of which includes running repairs, lubricants, electricity, garage, sundries and drivers as the operation division; battery, tires, overhaul and painting as the maintenance division, and amortization, administration, interest, insurance and taxes as fixed charges. In the forms for the gasoline trucks gasoline is substituted for kilowatt-hours under the heading of performance and gasoline replaces the item for electricity in the operation group, while the battery item is omitted from the maintenance division.

In the report on animal service the general heading includes rating (number of animals used), number of the company, business, service, period of data, number of units averaged, ratio of horses to wagons and value of investment; the heading of annual performance includes the number of miles, days each horse worked, days each horse was unable to work, the trips, stops and weight of loads; the annual expense is included in two groups, the first of which is made up of operating cost, including shoeing, veterinary, feed, stable, repairs, sundries and driver; and the fixed charges are amortization, administration, interest, insurance and taxes.

There are 36 different summaries for electric vehicles, 10 for gasoline trucks and 12 for horses, a total of 57 examples. It is a fact that in no instance has the

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summary been filled out as desired, there being from two or three to practically all the items omitted, and in some cases the annual expense is given as a single total.

The methods of the investigation are not criticised, but the insufficiency of the information is pointed out to illustrate how indifferent concerns have been to the expense of haulage, and to emphasize that it is only by the continuance of the inquiry and the widest publicity to the reports that there will be realization of the economies that are possible. As this is the first time that the importance of the work has been brought to the attention of the public, and there is no reason why the information should not be of general benefit, it is evident that the general character of the results is dependent upon the attitude of the business men approached. As the identity of the firms are not known and it would be practically an impossibility to connect any concern with the facts contained in the reports, there should be no reason for diffidence or withholding information that will be so useful and beneficial.

Perhaps one of the most frequent reasons stated for lack of facts is that the company has been "too busy to obtain them." This is a strangely inconsistent statement to come from a concern that will figure its manufacturing cost and its selling and advertising expense to a thousandth of a cent, and yet such firms will ask to be shown information directly concerning their haulage that they have not regarded as of sufficient importance to ascertain from their own records.

It is best to make clear that the research work will improve in the ratio that exact information is supplied. Its value will be to the people as a whole what they make it, and it is certain enough to secure what will benefit one it will be necessary to undertake an accounting of a delivery service that the research data can be utilized. To illustrate, all the system or organization method that may be devised is absolutely valueless to any person unless it is employed, and to have value it must be measured by results obtained previous to its adoption. Only by such comparisons can its worth be determined, and no facts or information that may be gathered will be beneficial unless uses are made of them.

It is not to be assumed that summaries of the character briefly presented in the research bulletin will be sufficient, because there are innumerable essential details that are perhaps peculiar to each concern that must be considered. For instance, the general business of the firm must be known to the extent defining the character of its haulage, the topography of the city where it is doing business, the nature and proportions of its equipment, the method of maintenance, the tonnage hauled and the conditions under which the freight is unloaded and loaded, the facilities for handling the freight at either end of the hauls, the manner in which the delivery routes are made up and covered, the overhead expense, the cost of labor, the facilities for repairing, the quality of maintenance, the class of paving or roads on which the vehicles are driven, the speed permitted, whether or not overloading is permitted, and the mechanical capacity of the driver or those having charge or supervision, provided that the service is of motor vehicles, must be stated. If electric machines, the cost for electricity, the facilities for charging, whether stored in a public or private garage, and perhaps other data are essential. If animals are used the number of horses rented is a factor of importance, and the influence of organized labor upon wages and service is a desirable fact.

It is understood that conditions differ materially, and there are so many factors to be considered that it is not possible to average results, which brings the comparisons down to each form of service as employed by the same concern.

But with all this the main problem that must be solved is how can the delivery with motor vehicles be arranged to obtain the fullest benefits of the increased speed, and how it is practical to utilize all of the time that is possible in actual haulage and minimize the loading and unloading. An example of this may be cited in which a large firm employing a motor truck in its delivery sent large loads of its goods to a point about 25 miles distant, and worked the machine to what might be regarded as the maximum speed that it should be driven, but required the driver to spend an hour loading and another hour unloading, so that while the man was exceedingly busy the truck was idle for practically a third of the time it was engaged in what ought to have been its most productive work. These same methods were the vogue with all delivery made by the truck, simply because they were those employed with horse vehicles. The saving of time by unloading and loading to a system, by traversing specified routes, by avoiding congested traffic, by many possible economies, had not been realized. Perhaps these possibilities had not been considered.

This case in point is stated to emphasize that the summaried figures of this firm's annual work and operation alone would be practically worthless as a measure for the determination of the performance of other deliveries, because it had been apparently assumed that the possession of the truck was a saving and no attempt had been made to secure its largest productiveness. In other words, unless the fullest details are stated it is impossible for practical results to be obtained from the summarized statements. Tonnage carried at a stated cost means nothing unless qualified, because the conditions in which the work is performed may have necessitated abnormal expense, or they may have been exceedingly favorable. Maintenance and upkeep are never uniform, and in the one case may be at minimum through careful attention, or maximum from carelessness and neglect. Again the tire mileage may be large or small, according to the judgment and care of the driver.

Perhaps the better way of stating the unsatisfactory nature of two series of figures as applied to haulage, without analysis of the facts of the work, is to say that without knowledge of administration, and

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unless the service is absolutely identical, these may be in every way misleading, no matter how conscientiously they may have been compiled.

The summaries, however, do not by any means indicate the thoroughness of the investigation as made by the department, and it is expected that in later bulletins much material information will be included that is now covered in a statement of the scope of the work. It is made clear that this report is preliminary from every point of view and that there is realization of the extremely wide variance of service; that the type of vehicle best suited to a particular class of service will depend generally upon the nature of that service; that a complete understanding of the character of the service to be performed, as well as a thorough knowledge of how each element of service affects the cost of operation of each type of vehicle, is essential before a decision can be reached as to the relative economy of the three types of vehicles (animal, gasoline and electric wagons.)

For this reason the investigation is pursued along two lines, the one of which is the determination of the demands of the various kinds of service, and the study of the relative economy of the three types of wagons when used in any given service. The subject of loading and unloading, as determined from the average mileage a vehicle may be driven in a day, and the standing time (when the vehicle is idle) is given extremely careful study. The average distance a vehicle may be driven a day under ordinary conditions, assuming no obstruction from traffic, is termed the distance capacity, and the ratio of actual miles a vehicle is driven to the number of miles it may be driven is regarded as the distance factor of the machine. The greater the distance factor the less will be the cost a unit of the service, and the natural conclusion is that every effort should be made to increase the distance factor. It is pointed out that to insure the largest distance factor may necessitate material changes in a service when motor vehicles are substituted for animal wagons, and that data are being collected with a view of determining where modifications can be made to increase the distance factor of such service.

The report further emphasizes that in most cases the period covered by the report for the maintenance charge is not long enough to be representative of the average throughout the life of the machine, this being particularly true of the gasoline trucks, because comparatively few were marketed prior to two years since. Also, that the total only includes the items which the various companies charge against their trucks; that these items of cost actually exist, no matter whether or not they are omitted from the accounting, and it is decidedly emphasized that many users of motor and horse drawn vehicles are misleading themselves as to the total expense of operating their deliveries, because of neglecting many of the contributory items.

Statement is made that performance records are extremely meagre, especially with horse wagons; that the relative cost of performing a given service by means of the three types of vehicles, however, depends to a very marked degree upon the nature of this service, particularly upon the loading and unloading conditions and the limitations of speed due to the traffic conditions of the streets. To obtain accurate data the institute has installed upon a number of wagons and trucks recorders that record on tape the stops and movements of each, the indications being of time and speed and distance travelled. Nine different concerns are now, or will shortly, furnish the department with these daily records. When the report was compiled 45 tapes were received daily, and it was expected to increase this number to 70, these representing work in city pick-up, furniture moving, freight handling, baggage transfer, wholesale and retail coal delivery, parcel delivery, bottled goods delivery, installation and maintenance service of an electric light company, and miscellaneous haulage. The types of vehicles range from one to three-horse teams and from 700 to 10,000-pound trucks.

It is stated that when the study has extended over a number of months it is anticipated that it will be possible to arrive at definite conclusions regarding the demands of the various classes of service. Without definite knowledge as to the average running speeds, the time required for loading and unloading, the time a vehicle is moving with and without load, the number of stops a mile, etc., it is impossible to predetermine the cost of performing a given service.

The institute is observing the vehicles visiting the in-bound and out-bound freight terminals of the three railroads centring at Boston, the observations including the average time taken for the several types of wagons at definite daily periods, covering entering, backing, loading and unloading, exit and delays. As the distances from these freight houses to the Boston wholesale district are comparatively short the length of delays is expected to have important bearing upon the work performed by any vehicle.

In addition the institute is conducting tests concerning the energy consumption of electric trucks when operated over different kinds of paving in Boston, with specific reference to the effect on energy consumption of non-skidding devices, which experiments will be continued with broader scope. Besides this, the investigation is being directed toward the collation of battery life and tire endurance data. Obviously considerable time must elapse before dependable facts may be made public.

PACKARDS FOR EXPRESS COMPANY.

The American Express Company recently placed in commission at Gloucester, Mass., two three-ton Packard trucks, made by the Packard Motor Car Company, Detroit. These vehicles will do the work formerly handled by several horse drawn vehicles, and the plan is in line with a policy adopted only a short time ago by the same company in Rockport, Mass., and Manchester, N. H.

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ATLANTIC ELECTRIC TRUCKS.

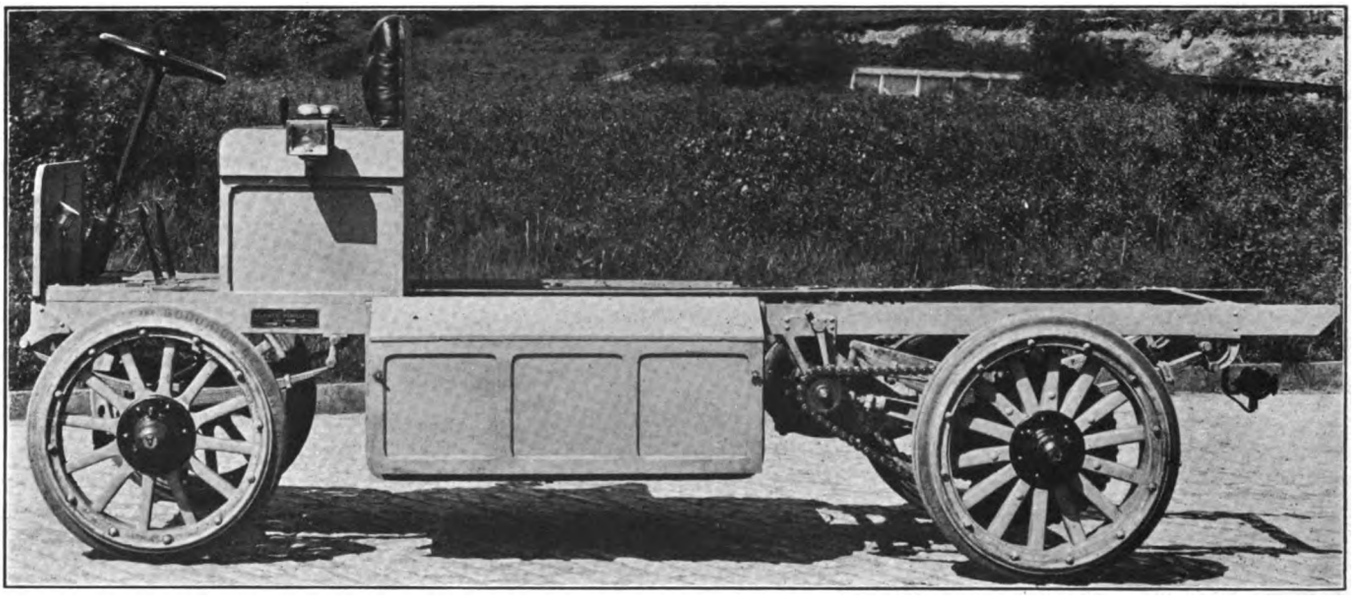
ELECTRIC service wagons, with capacities of one, two, 3.5 and five tons are produced by the Atlantic Vehicle Company, an organization with general offices at 1600 Broadway, New York, N. Y., and a factory at Newark, N. J., these being built to designs by Arthur J. Slade, who has for seven years given his attention to motor truck engineering and study of transportation problems. It is claimed for the Atlantic machines that they represent the most advanced practise and, as the electric vehicle has passed the period of experimentation, they can be guaranteed in every respect as to design, material, workmanship and service.

The company engaged in the industry after careful investigation of the possibilities of electric motor wagons, the determinations being based on extended observation of the work practical with such vehicles and the needs to insure the greatest economy of haulage. The machines produced were not offered in the market until every detail had been worked out to the satisfaction of the engineering department, and it was believed that the production would compare favorably from every angle with all other standard vehicles of similar type.

The factory is completely equipped with machine tools and facilities for building the wagons and in connection with it is maintained a service department which is available at all times to Atlantic truck owners for aid in operation and maintenance of the machines. The company is thoroughly organized in every respect to construct, market and care for its vehicles, and it is prepared to produce whatever is desired within the range of capacities stated.

The Atlantic electric wagons are of one design, though of differing sizes, and a description of any one will serve as well as of all, it being understood, of course, that dimensions are varied. In this instance the two-ton wagon is taken as a subject. The design is what is known as the "low-seat" type, in which the seat and footboard are not incorporated with the body, but are located on the chassis frame, the space taken up varying from about 33 per cent. in the ton wagon to about 24 in the five-ton vehicle. The variance is from the fact that there is no greater requirement for the larger machine than for the small, while the loading space is proportionately increased with the greater capacity.

The wheelbase lengths of the wagons are respectively 102, 114, 135 and 144 inches in the order of capacity, and the purpose of the designer has been to carry about a third of the load on the forward wheels and approximately two-thirds on the rear wheels. It is believed that this weight distribution will afford the greatest ease in steering and control and sufficient traction at the rear wheels at the same time.



The Atlantic Electric Truck Chassis of Two Tons Capacity, Built by the Atlantic Vehicle Company, Newark, N. J.

In the Atlantic trucks many of the components are the standardized productions of the best known and most dependable manufacturers. For instance, the motors are built by the General Electric Company, as are the controllers, while the front and rear axles, including the brake shoes and brake drums, are Timken products. The reason for the use of products of this character is that it is believed that as they are made by concerns of recognized reputation, are the results of long and well founded manufacturing experience, are made to correct designs from carefully selected materials, have been developed by experts with a view to the commercial possibilities, they are in every way reliable. Not only this, but parts may be secured in the open market, ordered from the manufacturers or their branches with a certainty of having a standard quality and being of absolutely precise proportions. In addition there is an economy in maintenance that is to be considered by the purchaser.

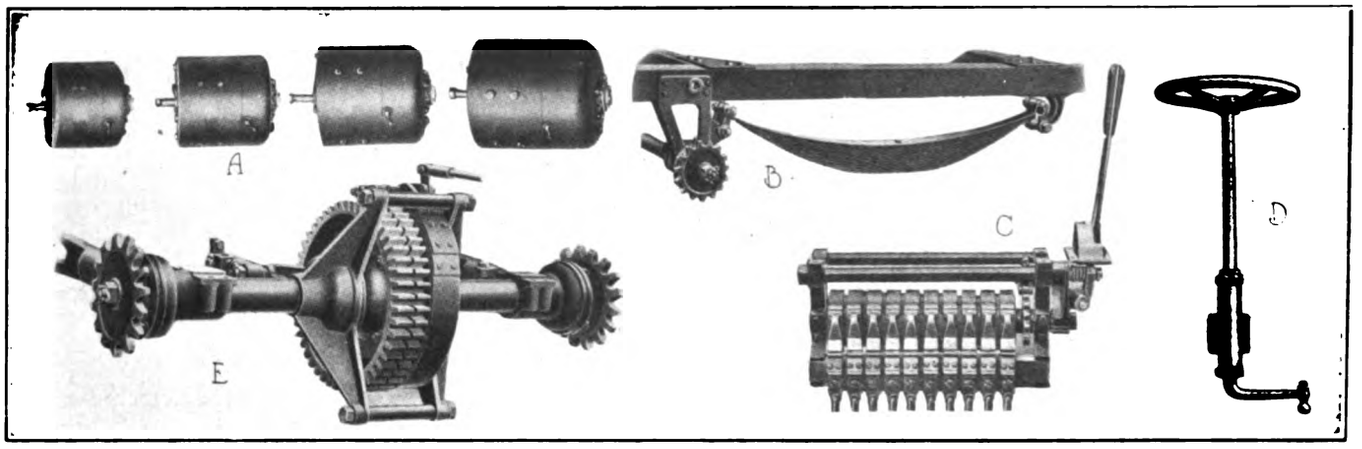
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The general design of the chassis includes a single motor of sufficient capacity which drives through a countershaft through a double chain reduction to the rear wheels, the energy being furnished by a battery carried in a stoutly constructed box suspended from the chassis frame between the countershaft and the rear shackles of the forward springs. The battery may be of any standard make from any type suited to the vehicles that the purchaser may care to use.

The motor is enclosed in a pressed steel housing or shell and a section of the case at the commutator end is hinged so that it may be lifted to examine or clean the commutator, lubricate the bearings, etc. This cover is closed securely by a clamp and then the motor is protected against dust, water and mud, or any substance that might cause deterioration. The design is intended to save weight, occupy minimum space, and give enduring construction at moderate price. The high rotative speed is expected to yield correspondingly high electrical efficiency, conserving the battery and increasing the possible mileage, while mounting the motor high protects it from road obstructions and probable damage.

The motors are of the four-pole type, series wound, and operate at 85 volts, which is regarded as being the most advantageous potential when used with lead batteries, and liberal electrical factors make possible their use with high overloads for considerable periods of time without deteriorating results. The commutators are of small size and the high grade carbon brushes of large area insure the perfect commutation required when used with storage batteries. The friction loss is minimized by employing ball bearings for the armature shaft. These motors are constructed to endure 300 per cent. overloads, which affords comparatively high power when it is needed. The motors are suspended from a stout frame cross member by hangers bolted to the shells. The pinion or sprocket of the armature shaft is connected with the countershaft gear by a Morse silent chain that is enclosed in a case, this case being solidly secured to the motor shell and to the countershaft, and when packed with lubricant it needs but little attention other than to renew the grease from time to time. The interior of the case may be examined easily when desired.

The design of the jackshaft is such that it may be removed as a unit from the chassis and similarly restored. The jackshaft housing is composed of two cast steel end members that are formed to be bolted to the hangers at their inner ends, and the outer ends carry the large annular ball bearings. To these members are attached the forward ends of the radius rods. Into these members are brazed the outer ends of the Shelby steel tubes of the housing, and the inner ends of the tubes are brazed into large malleable iron spiders that are bolted together and surround the differential gears and the chain sprocket. These spiders also support the chain case, which serves as a diffential housing as well. The differential assembly is a bevel gear and pinion type, with the gears of 3.5 per cent. heat treated nickel steel, and on the cage or housing is mounted the chain sprocket, beside it being the contracting band transmission brake. The differential is carried on large annular ball bearings and the shafts are of 3.5 per cent. heat treated nickel steel.



Components of the Atlantic Electric Trucks: A, the Motors for the One, Two, 3.5 and Five-Ton Machines; B, Jackshaft Hanger and Rear Spring Suspension; C, Controller; D, Steering Column and Gear; E, Jackshaft Assembly.

The jackshaft assembly is suspended in crucible steel cast hangers that are formed to carry the shackles of the forward ends of the rear springs. These hangers are of large size and are hot riveted to the chassis frame. By the removal of the retaining bolts the jackshaft may be dropped from the hangers in a comparatively brief time. The outer ends of the driving shafts carry the cast steel driving sprockets and from these the chains extend to the cast steel sprockets that are bolted to the rear wheels.

This description will indicate that the moving parts of the chassis, aside from the wheels and steering gear, and brake, are comparatively few.

The controller is selected with reference to the motor and, being a product of the same maker, ought to yield equally good results. This controller is of the continuous torque type, a design that eliminates the objectionable jolts caused by the opening of the circuit when passing from series-multiple to multiple connection of the field coils, which adds considerably to the life of heavy vehicles. With the single motor

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series-parallel arrangement of the field is the standard form of control, and resistance is used on the intermediate steps, the controller having a sufficient number of notches to safeguard the chains and gearing of the transmission. The controller is of the drum form, operated by a pinion and sector at one end. The sector is mounted on a countershaft carrying the operating handle, which is made of drop forged steel. The controller is mounted under the driver's seat and the handle is at the left side. It affords four forward speeds and two speeds in reverse. The contact fingers are liberal, in cross section area of contact and should endure for a long period, while they are extremely accessible in the event of renewal being needed.

The chassis frame is of structural steel channel section four inches width, and weighs 5.25 pounds to the running foot. It is constructed with sturdy cross members and all the joints and gusset plates are hot riveted. The spring hangers are of liberal size and are steel castings with bushings and self-lubricating bolts. It will be understood that wear at these points is minimized and renewals may be made with a comparatively small expense. The springs are of ample length and width and are of Krupp silico-manganese steel. The design is a comparatively large number of finely tempered plates and the purpose is to so combine strength and flexibility as to minimize vibration and road shock, and at the same time fully protect the chassis frame and the load. The springs are semi-elliptical, with a minimum of camber, and the eyes are fitted with bronze bushings and self-lubricating bolts, hardened and ground. The rear ends of the forward springs and both ends of the rear springs are shackled and the movement of the chassis frame and body is fully compensated.

The front axle is a heavy I-section of high quality drop forged steel, with the large yokes designed for hard service, and the pivots and wheel spindles fitted with Timken roller bearings. The rear axles are rectangular, of the same material, and are equipped with similar bearings. The wheels are built to special design and the spokes are rectangular in cross section, having ample support at the hubs and being flared at the outer ends with the larger sizes. The felloes are wood and are held by heavy steel bands shunk on. The wheels are built to the S. A. E. standard and will take all standardized tires. The wheels of the smaller types are 34 inches diameter front and 36 inches diameter rear, and with the larger sizes 36 inches diameter front and 40 inches diameter rear.

The steering gear is placed at the left side of the chassis. It is of an irreversible worm type with an unusually large contact surface and for this reason the wear is very slow. The gear is mounted in a bracket supported by the chassis frame and at an angle convenient to the driver and it is turned by an 18-inch hand wheel. There are two sets of brakes, both operated by pedals. The one is external contracting on a drum on the jackshaft, and the other is internal expanding within large drums mounted on the rear wheels. The jackshaft brake drum is cast integral with the jackshaft sprocket and the band is lined with an anti-friction material. The shoes of the wheel brake are faced with a similar material and these operated against the pressed steel drums. The radius rods are of cast steel and at the rear ends are bushed with bronze to resist wear. These rods are adjustable at the forward ends.

All wearing parts of the chassis are provided with compression grease cups of sufficient proportions. All the forgings, including the brake levers, pull rods, brake shafts, are of manganese steel, carefully heat treated to afford maximum strength. The battery boxes or cradles are constructed with floor, sides and ends of wood carried in a stout angle iron frame, from which the battery crates may be removed or installed at either side. These are proportioned for the requirements of the vehicles.

All chassis are provided with dashboards, footboards, driver's seat boxes, (in which the controllers are mounted and tool spaces are provided) Sangamo ampere meters, main circuit switches, charging receptacles, tail lamps, two side lamps, electric bells and set of tools. The bodies are built only to specifications, and while the company is prepared to furnish whatever a customer may desire, this equipment is not considered with the chassis, nor included in the prices quoted.

ELECTRIC TRUCKS MULTIPLYING.

That the electric wagon is recognized by business men as having qualities that make for extreme endurance and economy is especially noticeable in the cities of considerable proportions, especially in Boston, where the purchasers require long and careful demonstration of capacity and expense. The Bostonians have this season adopted electrics in numbers surprising to the observers, and the orders from New England for General Vehicle wagons are averaging two and three a week. The number of machines in Boston alone may be understood from the fact that there was more than 50, some of them highly decorated, in the annual parade of the Joseph Warren Association in that city July 4, while in the Memorial Day procession there were 153. Nothing could more thoroughly demonstrate the fact that electric wagons and trucks are in use.

The perfection of the machines in the last few years by the use of lighter and better materials, the utilization of the single motor, the decreased weight and greater mileage of the battery, are some of the reasons, to say nothing of the special production of electric energy by the lighting and power companies. Not only this, but by the exchange of batteries it is possible and practical to keep a wagon working as constantly as could be desired.

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G. V. COMPANY TO BUILD MERCEDES TRUCKS.

PRESIDENT P. D. Wagoner of the General Vehicle Company, Long Island City, N. Y., makes the following statement relative to the acquisition by his company of the American right to manufacture and sell the Mercedes gasoline truck, built in Europe by the Daimler Motoren Gesellschraft, in response to a very general request for information from the trade and those concerned in highway transportation throughout the country:

"As the largest builders of electric commercial vehicles in the world, the General Vehicle Company has had an opportunity in its 12 years' experience of studying deeply, not only problems of truck manufacturing and vending, but of service adaptability as well. The wide distribution of its product has shown that well built electric trucks can care for from 80 to 85 per cent. of all average urban trucking and delivery. That is, in relatively short haul work, especially where stops are necessary, the electric is the most economical as well as the most dependable commercial vehicle. For longer haul cross country work, where higher speed and greater radius of action are essential, the gasoline truck is unquestionably superior. The General Vehicle Company, while recognizing this situation in the past, held strictly to the electric field and where the service conditions warranted it, cheerfully recommended gasoline trucks to its own customers.

"Financial strength and the ability to supply a complete commercial vehicle equipment for any line of business have now become two of the requisites necessary to the successful manufacture of motor trucks. We have ample capital and the development of the art has reached a point where it has seemed wise for the General Vehicle Company to be in a position to supply purchasers requiring long and short haul service with their entire motor truck equipment, particularly as many of them, after using G. V. trucks for years, have made this suggestion. Many of its customers seemed disposed to realize the advantage to them of dealing with one large, strong manufacturer, rather than with several.

"In studying the problem, investigation revealed the fact that a large number of American made long distance trucks seem to have been designed for city rather than cross country service. Instead of being constructed for years of hard work under variable conditions, they seemed designed more to compete in the sphere of the electric, which is not, and cannot be the sphere of the gasoline machine.

"After thoroughly analyzing the situation in America, I turned to Europe in our search for the ideal, spending three months in continuously studying European conditions and designs, accompanied by our factory manager and our engineer. We investigated all motor trucks of European manufacture, and interviewed hundreds of users. Our investigation developed the fact that while there were good trucks in England, France and Germany, giving good results under their conditions of road operation, there was only one truck which was unquestionably fitted for service under American conditions, namely the Mercedes. We were surprised to find that not only was this truck giving excellent results over a long period of years where road conditions were favorable for heavy haulage, but in certain mountainous and rural districts where we found road conditions fully as unfavorable as we have here, this truck was giving from six to 10 and even 12 years exceptional service. Its record in cross country work compared very favorably with shorter hauls on perfect roads. This was a revelation, and our investigation convinced us that the Mercedes was the best truck in the world for long haul work in America.

"After considerable difficulty we succeeded in securing the right to import German manufactured Mercedes commercial vehicles and the exclusive manufacturing rights for the same in the United States. This places the General Vehicle Company in the enviable position of offering the public the oldest and best electric truck in the world, and the oldest and best gasoline truck. The American built Mercedes truck will be a replica of that of German manufacture and will be manufactured from the original drawings of the Daimler Motoren Gesellschraft, which will also furnish material, tools, jigs and fixtures.



P. D. Wagoner, President, General Vehicle Company.

"Pending the completion of manufacturing arrangements we will import Mercedes trucks to supply immediate demand and we feel confident that the patronage which we have long enjoyed for our electric trucks will be extended to the new line.

"The electric truck and the gasoline truck each has its particular field and the General Vehicle Company is now prepared to cover the entire field of commercial vehicle service. It will continue its past practise of recommending and selling the proper vehicles for each class of service."

The Eisner-Lenk Company was incorporated recently in Boston for $50,000. It is planned to manufacture a line of commercial cars. The incorporators are Harry Eisner, Oscar C. Lenk and Albert F. Lenk.

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MANY ORDERS FOR BAKER WAGONS.

The Baker Motor Vehicle Company, Cleveland, O., has received numerous orders for two-ton wagons for express service, one of the recent shipments being 12 machines consigned to the American Express Company, Washington, D. C., where they will be used in delivery work in that city. The company maintains that the orders received are the results of demonstrations of efficiency and economy. In many large cities the express companies are substituting the electric wagons for horse vehicles, and changes are making as rapidly as is convenient. The Baker company states that it now has orders for installation equal to that at Washington for 17 different cities, and it points out that this is the result of satisfactory work accomplished for others before the big common carrying corporations decided on the efficiency and endurance of these wagons. These orders are in addition to those which brought about 100 vehicles to New York, Boston and other large commercial centres. That 70 per cent. of the year's business of the Baker company was in the form of repeat orders from satisfied users of Baker machines is claimed by the officials as the best indication of the character and quality of its electric wagons.



Type of Two-Ton Electric Delivery Wagons, Built for the American Express Company by the Baker Motor Vehicle Company.

ELECTRIC VEHICLE ECONOMY.

With a knowledge based on experience since the concern was established the General Vehicle Company, Long Island City, N. Y., has fixed the life of an electric wagon at 10 years. This means in average work and with average care. There is reason, however, to believe that with further experience by owners this could be improved upon. The conclusion is well founded and it is conservative from every point of view.

Taking the estimate made for the vehicle of 2000 pounds capacity, which the company sells for $2100 with an acid battery, without body, the fixed charges are given as $470.50, which include amortization (10 per cent. annually on the purchase price), interest, fire and liability insurance, or 20.47 per cent. of the total operating expense. The replacement charges include replacements of batteries, tires, chains, gears and sprockets, bearings and all other worn parts, and these amount to $584.15, or 25.40 of the operating expense. The garage charges include electric current, rent, light, heat, garage labor, etc., and totalled $493.15, or 21.45 per cent. of the operating expense, leaving the driver's wage of $750, 32.68 per cent. of the operating expense.

It will be seen that the fixed charges and the wage of the driver amount to $1220.30, and that these cannot well be changed. Whatever economies are made must be made in what may be regarded as the operating costs, and here is the actual saving of the electric vehicle, because of its long life and endurance. Thus the operating expense may be averaged at $1077.30 annually. Contrasting this with two single horses and two wagons of similar capacity: The initial cost of animals, vehicles and equipment would be $1200, and the fixed charges would be about $200 yearly. The cost of care and attendance of the two outfits would be $2 a day, or $730 a year, and the cost of two drivers woud be $1500 annually, so that the keep of the horses and the wages would amount to $2230, and the fixed charges $200 more, or $2430, against the $2297.80 of the electric wagon.

Because the horses and their equipment cost less to purchase is no criterion on which to base judgment. The maintenance of the vehicle is somewhat more than might be paid for two horses, but with the cost of two drivers to be considered the argument is all in favor of the motor wagon. Considering 300 working days of the year the daily average cost of the electric is $7.659, as against $7 a day for horse keep and drivers wages alone, and the machine has at least double the mileage and equal carrying capacity.

ENDURANCE OF THE ELECTRIC MOTOR.

There is nothing mysterious about the motors employed to drive electric vehicles. The only moving part is the armature, which revolves on the highest grade ball bearings and has sufficient velocity to furnish the required power, which is applied through the jackshaft and reduction sprockets and chains to the rear wheels. The electric motor is regarded as being the most economical form of prime mover because its

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power can be graduated and the current necessary for a given work can be utilized. The largest and most carefully developed manufacturing plants are constructed with electric generators that produce current that is used in individual motors as required. There are establishments in which all the power is furnished by central stations and supplied for whatever machinery is used as needed, this being more economical than operating a power system which is not always in service.

It is true that motors will wear, but they wear very slowly. They can be restored and will continue to afford service to a surprising degree. The loss through friction is exceedingly slight. The electric street car is in every way dependable. The electric railroad car or motor may be used for years and is so reliable that it is used by the largest corporations engaged in transportation. These cars and electromotives are driven by exactly the same types of motors that are used in electric power wagons. They are built for hard service and to yield the highest degree of efficiency. The wearing parts are the shafts and the bearings, and these may be renewed, while the commutator segments and the brushes may similarly be replaced.

The motors have speed of from 1200 to 2000 revolutions a minute and the work is done with comparatively little vibration. Being encased and absolutely protected from all abrasive substances, and from water and dampness, the deterioration is minimized. The only attention given is systematic lubrication of the bearings and cleaning of the commutator, which will insure continuous and effective operation.

IMPORTANT COURT DECISION.

A recent decision handed down by the Michigan supreme court in the action brought by William G. Isbell against the Anderson Carriage Company, now incorporated as the Anderson Electric Car Company, maker of the Detroit electric wagons, is of decided interest to those representing automobile manufacturers. In the lower court a judgment for $23,000 was given the plaintiff, but the higher court has reversed this decision.

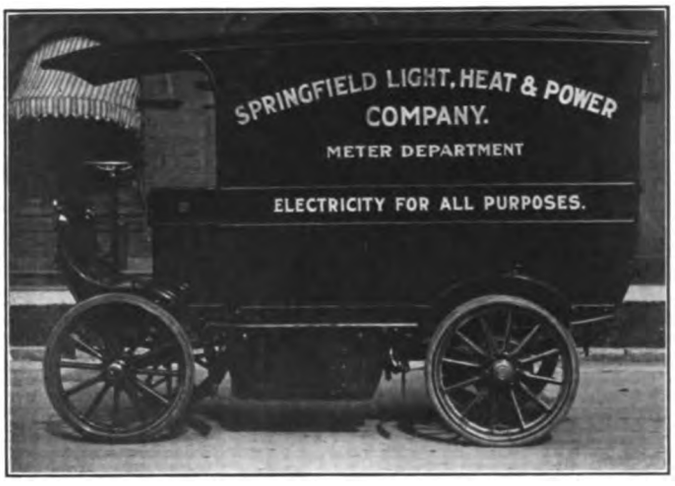
The original contract between the litigants called for the maintenance of a suitable garage for handling automobiles, together with such appurtenances as are usually required in such business. An auxiliary agreement made soon afterward, provided for allowing Isbell to place gasoline cars in the garage, as well as those of the electric type, until such time as the business in the latter should have developed to a point where the caring for them offered a sufficient business to warrant their care exclusively.

The Anderson company later notified Isbell that he was not caring for the business properly, did not advertise sufficiently, did not provide proper labor for caring for the business and was not carrying any of the cars in stock. The result was the cancellation of the agreement.

Isbell brought suit and obtained the judgment stated. The appeal resulted in a reversal. The grounds appear to have been many, among others being reference to the opening of two garages by the Anderson company, with a sufficient number of employees to care for the business and to the success which has followed this policy. The advertising done and the broad policy pursued by the company were referred to and the court said it was this evident success under progressive management that had caused the lower court to render such a large verdict in the suit.

METER DELIVERY WAGON.

The Argo Electric Vehicle Company, Saginaw, Mich., has delivered to the Springfield Light, Heat and Power Company, Springfield, Ill., a 1000-pound enclosed delivery wagon to be used by the meter department of that corporation. This is regarded as a type that is well adapted to all purposes where reasonable capacity and extended mileage is desired. The



The 1000-Pound Electric Delivery Wagon Delivered to the Springfield Light, Heat & Power Company by the Argo Electric Vehicle Company.

body is a regular panel equipment and has a wide seat and abundant leg room, with a sightly dash and a long hood that affords complete protection for the driver. It is adapted for either summer or winter work. The wagon is geared to give a speed of 12 miles an hour when this is necessary, and the mileage of the battery is claimed to be 50 or thereabouts to the charge.

The Argo electric has the rear axle and the motor constructed as a unit and the drive is by herringbone gearing from the motor, giving a powerful and silent transmission. The motor is a Westinghouse and the control is incorporated with the steering column construction. There is a double set of brakes, internal expanding in drums in the rear wheels. The ratchet brake interlocks with the control so that the brake cannot be set with the power on and the power cannot be applied with the brake set. There are four forward and two reverse speeds. The springs are of the semi-elliptic form.

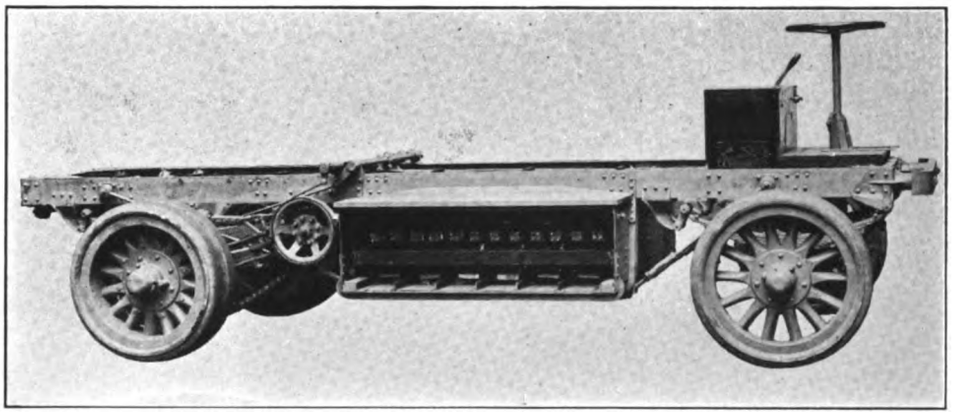
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WAVERLEY FIVE-TON TRUCK.

The Waverley line of electric service wagons, made by the Waverley Company, Indianapolis, Ind., now includes a five-ton vehicle, the first of which was recently produced. The Waverley Company is one of the oldest concerns in the industry, perhaps the oldest now doing business, and while its experience was originally with pleasure machines, it has been making wagons for years.

This five-ton chassis is regarded as the best that has been produced by the company, it being perfected in every detail that long experience and sound engineering could suggest, and designed to have long endurance under extreme conditions of service. The chassis weighs 8660 pounds and the battery 2540 pounds, to which must be added the weight of the body installation. The chassis is built with a view to extremely heavy work, such as brewery delivery and the like, and it has a rated mileage of 35 miles a charge on what may be regarded as level roads.

The machine is driven by single motor, 85 volts, 60 amperes, which is suspended from hangers at the extreme rear of the chassis frame, being protected from contact with anything that might cause damage by the heavy frame and the rear axle. The drive from the motor is by shaft to a jackshaft in which is incorporated a differential gearing, and thence by side chains to the rear wheels. The current is drawn from a battery of 42 cells of 25 plates each, having a capacity of 324 ampere-hours. The chassis is 212 inches length and the loading space is 168 inches length and 78 inches width. The wheels are shod with 36 by seven-inch tires forward and 36 by five-inch double rear tires.



Chassis of the Five-Ton Truck Built by the Waverley Company, Indianapolis, Ind., the Largest Machine This Concern Has Yet Produced.

One of the features of the design is the truss construction that is incorporated in the suspension of the battery box, which prevents springing and greatly stiffens the frame without the need of extremely heavy material.

The Hexoline Lubricating Company has been incorporated in New York City with a capital of $6250 for the purpose of making lubricants.

FEDERALS PERFORM SATISFACTORILY.

Where other trucks have failed, Federal trucks, made by the Federal Motor Truck Company, Detroit, are performing with satisfaction in and near Phoenix, Ariz., considered one of the hardest sections of the country on motor driven vehicles because of the extreme heat, steep grades and poor roads. A short time ago a sideboard Federal started daily trips between Mesa City and Roosevelt, a distance of 61 miles, over a mountain road with very steep grades. The round trip is made in 14 hours with a full capacity load, sometimes carrying several passengers. Another operates between Alhambra and Phoenix, hauling two trailer loads of brick. The latter has been making daily trips for nine months.

SPEEDWELLS IN CALIFORNIA.

The Speedwell Company of San Francisco, Cal., agent for the Speedwell Motor Car Company, Dayton, O., recently made some large sales in its territory, and is now selling on factory order. One six-ton model was purchased by McNab & Smith of San Francisco and the other by the Monarch Oil Refining Company, the latter being fitted with a three-compartment steel tank for carrying gasoline. In addition it will be equipped to carry case goods on the side. This truck will be used in making long hauls to Oakland. A. E. Moutrey of LeGrand is also among the recent purchasers of six-ton models; his vehicle will be used in hauling copper ore from Lewis to LeGrand for the Pocohontas Copper Mines Company. It will displace several horses and a traction engine. The length of the haul is 16 miles, and it is planned to make two round trips with the truck each day. The traction engine is averaging three round trips a week.

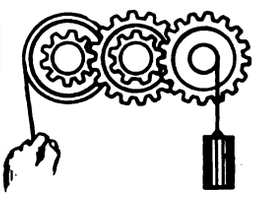
IMPROVEMENT IN SOLID TIRES.

Commenting on the matter of tires recently, F. F. Phillips of the solid tire department of the United States Tire Company, stated that, in his estimation, no period in the history of the motor truck industry has developed such marked improvements as this department during the last year. He says:

"Within the year manufacturers have increased their mileage guarantees 2000 and in some instances 4000 miles. It now is possible for a truck owner to buy tires covered by guarantees of 10,000 miles, irrespective of the city or locality in which they are to be used. Demountable solid tires for use on motor trucks have had the effect of generally improving service."

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RECENT MOTOR VEHICLE PATENTS



Weldon Spring Wheel.

A new type of spring wheel is noted in the invention of John Henry Weldon, Comanche, Okla. It has practically two rims, an inner and outer, and to the latter are attached the spokes which slide freely in hollow members. The inner rim is shorter to allow for the contraction of springs which are interposed between the two rims.

Benson Transmission Gearing.

A patent has been granted to Andrew Benson, Chicago, assignor to the Benson Gear Company. It comprises a transmission gearing including a worm mounted upon a shaft and meshing with a worm gear, the axis of the worm being angularly movable relatively to the worm gear about a pivotal axis located intermediate the ends of the worm.

Wagenhals Chassis.

An automobile chassis having two wheels in front and a single driving member in the rear, has been patented by William G. Wagenhals, Detroit, Mich. The front wheels are turned by means of the usual tierod operating the knuckles which are pivotally mounted. The power plant is located in the centre of the chassis and final drive to the rear traction wheel is by chain. An extension of the frame in front provides a step.

Morgan Loading and Unloading Device.

Ralph L. Morgan, Worcester, Mass., has been granted a patent for an unloading and loading device to be utilized with a commercial vehicle. It comprises a removable crate or body, a slip for supporting same and into which the machine may run, and means for depositing the crate upon the car, as well as for removing same. The loading operation is performed by the longitudinal motion of the truck which gradually raises the crate off its slip or support. Means are also provided for securing the crate.

Schumacher Steering Gear.

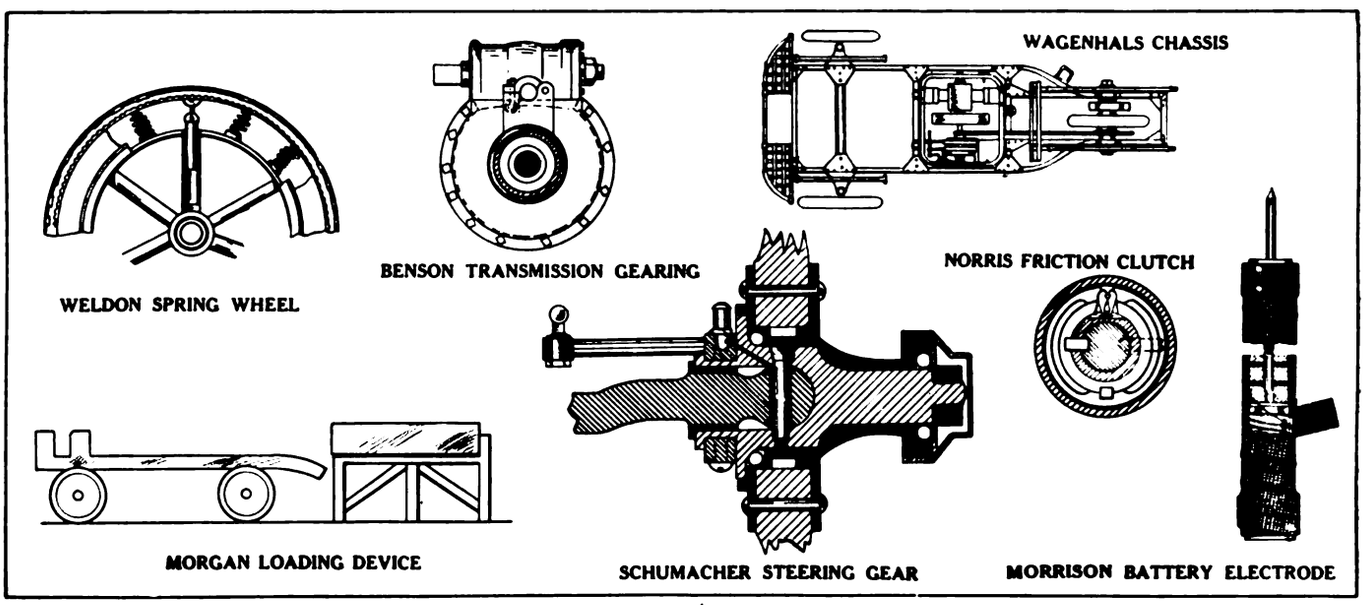
Henry Schumacher, Buffalo, N. Y., has been granted a patent for a steering gear comprising an axle arm having a spherical socket at its inner end, a spherical knuckle seated in said socket, the latter having a vertical pivot opening, and an upright pivot pin. Means are provided for retaining the spherical socket.

Norris Friction Clutch.

A friction clutch has been patented by Henry M. Norris, Cincinnati, O., assignor to the Cincinnati Tool Company of that city. It consists of a shaft having a splined sleeve and a collar secured to the latter which is fitted with a contractile ring, also an idle member on the sleeve concentric with the collar and twin levers carried by the collar and engaging with the ring. A movable wedge is provided for simultaneously actuating the levers into frictional engagement with the idle member.

Storage Battery Electrode.

William Morrison, Des Moines, Ia., has taken out a patent for a storage battery electrode, comprising a body of active material and a helically wound strip of wire gauze surrounding and enclosing the latter. Alkaline electrolytes are utilized.



Some of the Recent Efforts of Inventors Working Along Lines Applicable to the Commercial Vehicle, Including a Spring Wheel, Unloading Device, Battery Electrode, Chassis, Etc.

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Devoted to Motor Driven Business Vehicles of All Classes.

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Anonymous communications not considered. Correspondence on subjects relating to trucks, delivery wagons, taxicabs, tractors, all motor driven farm, fire and municipal apparatus, the motor industry and the trade, will receive attention. Stamps must be enclosed to insure return of unsolicited contributions.

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RESPONSIBILITY OF OPERATOR.

While it is admitted that the motor truck may safely be placed in the hands of the driver of the horse wagon it is to replace, the purchaser ought not to lose sight of the fact that the mechanical transport means a larger investment than a single animal conveyance, and that the operator's responsibilities are somewhat increased by the change. This is a decided factor in studying the modern haulage problem.

Those who are interested in impressing the business world of the thorough practicability of the power wagon take pains to indicate that the utmost economy effected is measured very largely by the maximum efficiency of the machine. In obtaining this result the chauffeur plays an important part. It follows that he should be granted every incentive to secure the utmost from his truck.

However, nothing is to be gained by urging the machine beyond its capacity, either as to loading or driving. Careful study generally will reveal leaks in the least suspected quarters. In many lines of business they will be found in the loading and unloading systems employed, and maximum efficiency nearly always obtains only when the truck is busy hauling goods.

Since the driver's responsibility is great, the incentive should be sufficient to warrant his proper attention to details. On the other hand, it not only will permit the owner to discover leaks, but assist the operator in preventing them to fit such appliances as experience has dictated are adequate for this purpose. The modern haulage problem is complex, and this is all the more true because generations of horse usage have left no dependable data upon which to base a foundation.

MOTORS IN HOT WEATHER.

It hardly seems necessary to point out that motor vehicles are not subjected to limitations by reason of weather conditions. Still, the experience of Springfield, Mass., during the recent heated period cannot well be passed without some comment concerning the comparative merits of horse drawn and motor equipment.

As is well known Springfield's fire department is well supplied with automobile apparatus. During the afternoon in question 14 alarms of fire were sounded within some three hours. Only one piece of horse apparatus was called upon to answer these, and this failed upon the third alarm. Needless to say, the motors were kept decidedly busy, and with the result that the saving in fire losses was sufficient to more than repay the original investment.

The situation is more marked in the municipal service cited, but it must be admitted by thoughtful business men that conditions are quite similar with respect to the average business life of the community. Just how much is lost during the stifling heat of the summers and the extreme cold of the winters, in depending upon horse transportation cannot be determined definitely, except where motor vehicles have been installed in competition with the less dependable outfit.

UNIVERSALITY OF THE TRUCK.

One of the most striking demonstrations which can be given the prospective purchaser of a motor truck is to stand him on a busy street corner and call his attention to the various uses to which such vehicles are being put. There is a truck for every line of business, and the big 10-ton dumper is closely followed by the 750-pound florist's wagon, while cars employed by caterers, grocers and laundries are intermingled with brewery wagons and contractor's machines carrying tons of steel girders.

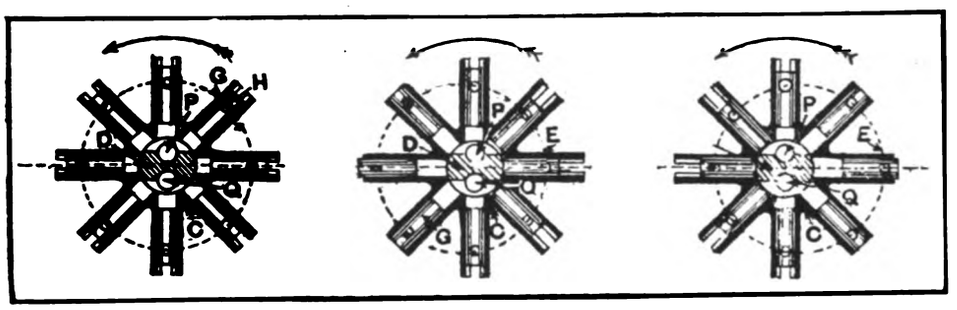
This universal employment of the mechanical transport is the result of such gradual development that it fails to impress the American public, except when time is taken to note the advancement. This is particularly true when compared with the results obtaining in this field abroad.

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HELE-SHAW HYDRAULIC TRANSMISSION.

Interesting Experiments in Great Britain Indicate Successful Results---Some Points of Difference When Compared with Manly Drive in America.

THE attention of English motor vehicle engineers has been recently directed toward public trials of a hydraulic drive or transmission, invented by Prof. H. S. Hele-Shaw, one of the leading motorists of Great Britain, who also invented the Hele-Shaw clutch. For years mechanical experts have sought a construction that would eliminate the clutch, transmission gearset and differential gearing so generally used in motor driven vehicles, and varying systems have been designed with more or less promise, but few with sufficient advantage to justify their general adoption. In America the Manly hydraulic transmission has been produced commercially in motor service wagon practise, and this was described in the February, 1912, issue of MOTOR TRUCK. So much interest has been evidenced in the hydraulic transmission of power that the Hele-Shaw device is of especial import to engineers, if not to those who are seeking economy and endurance in highway haulage.



Figs. 1, 2 and 3—Diagrammatical View Showing the Operating Principle of the Hele-Shaw Pump: C, Cylinder Body; D, Central Valve; E, Path of Guide Ring; G, Pistons; H, Gudgeon Pins; P and Q, Induction and Eduction Ports.

The Hele-Shaw invention employs a circulation of thin oil through a rotary pump that is coupled direct to the engine and a series of piping to motors incorporated with the rear wheels. In this it differs from the Manly transmission, which has a stationary pump and stationary motors, the final drive being by side chains to wheels on a dead rear axle. The transmission has been tested with a three-ton truck and it is stated that the power has been sufficient to climb a grade of one foot in four, or 25 per cent. The following description is reproduced from Motor Traction, a leading English power wagon publication:

"The basis of the invention is a pump of the rotary plunger type, which is positive in action, reversible, and is variable so far as capacity is concerned. The principle of operation may be understood by reference to Figs. 1, 2 and 3, and the drawings given in Fig. 4, the former of which show diagrammatical sections through the centre of an eight-cylinder pump at right angles to its axis, whilst in the latter are given cross and half-sectional views of a complete pump having five cylinders. In all the figures referred to C is a cylinder body driven directly from the engine and rotated upon a central valve or 'D' tube D, in which are cut the induction and eduction ports P and Q, which communicate with the suction and delivery oil pipes referred to later.

"The cylinders are fitted with pistons G, provided with gudgeon pins H which pass through slots in the cylinder walls and carry on each end slippers, shown at L L in Fig. 4, which fit in circular grooves or paths cut in what may be termed a floating guide ring E. This latter, as shown in Fig. 4, is made in halves, bolted together, and rotates on ball bearings M, carried by guide blocks which slide in grooves in the main casing K, and are connected in such a manner to a control spindle or lever that they may be moved horizontally from the outside of the casing in order to vary the position of the centre of the guide ring E in relation to the centre of D. In Figs. 1, 2 and 3 the guide ring E is represented by a dotted circle. Now when the cylinder body C is rotated in the direction of the arrows, and the position of the guide ring E is such that its centre coincides with the centre of D, as

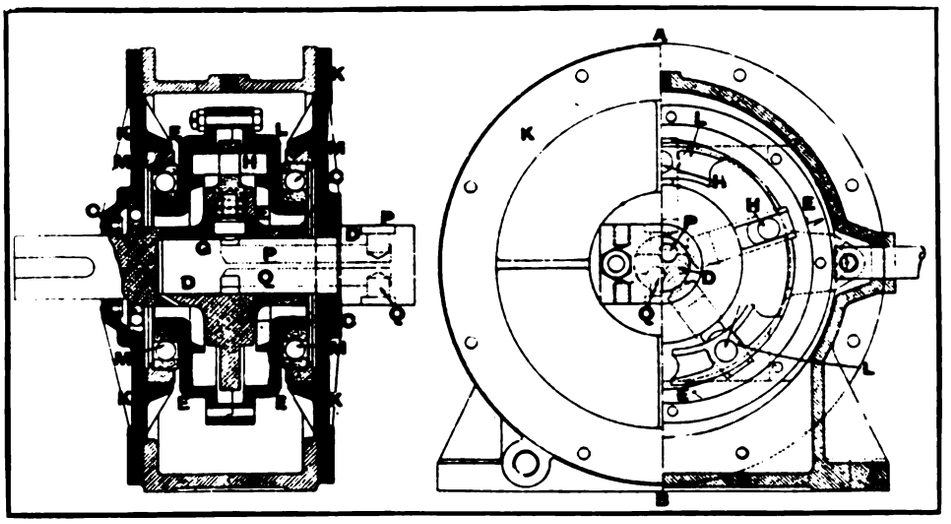


Fig. 4—Cross Sectional and Half-Sectional Drawings of the Hele-Shaw Pump: C, Cylinder Body; D, Central Valve; E, Guide Ring; G, Pistons; H, Gudgeon Pins; K, Pump Casing; L, Gudgeon Pin Slippers; M, Guide Ring Ball Bearings; P and Q, Induction and Eduction Ports.

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in Fig. 1, no radial movement of the pistons G takes place and no oil is delivered, but if the guide ring E be moved so that its centre is to the left of D, as in

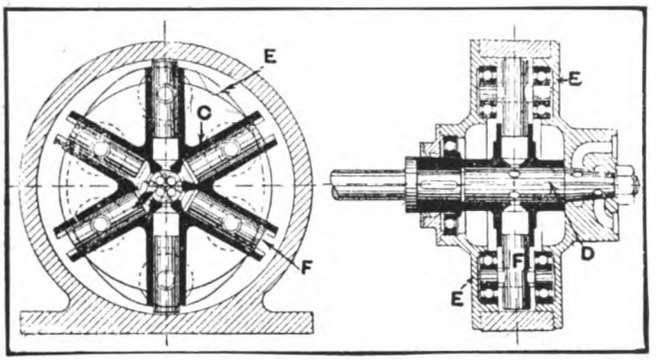


Fig. 5—Drawing of the Pump, Showing the Gudgeon Pin Slippers in Position and One of the Guides and Ball Bearings.

Fig. 2, the pistons above the centre recede from D and tend to form a vacuum, so that the working fluid is drawn through the port P, whilst the pistons below the centre approach D and discharge the oil through the port Q. By moving the guide ring to the right, the reverse action takes place, namely, oil is drawn through the port Q and delivered through P, although the direction of rotation of the cylinders has not been changed. It will be easily understood, therefore, that the length of stroke of the pistons, and consequently the rate of flow and discharge, is dependent upon the relative positions of the centres of E and D.

"An interesting and important feature is that, when the cylinder body C is revolved, the guide ring E revolves with it, as the resistance of the slippers in the grooves is greater than that of the ball bearings M. A great saving of power is thus obtained, and, further, it is evident that if the slippers move round the groove, the guide ring E would have to be retained full, or partly full, of oil in order to lubricate them sufficiently, which oil would then be churned up with a consequent waste of power. As E rotates with the cylinder body C and the slippers, it can be retained full of oil by centrifugal force, and yet no churning takes place, whilst the main casing K can be kept empty. It will thus be understood that the only place really subject to wear is where the cylinder body C runs on the central valve axle D, but this is kept so thoroughly lubricated by a slight leakage of oil that the amount of wear is inappreciable after long periods of running. It should be noted, too, that as the pressure in the system, and consequently the load on this bearing, increases, the pressure of oil in the bearing also goes up, and so counteracts the effect of this increase of load. To give an example of the small amount of wear which takes place, we may refer to the Hele-Shaw-Martineau steering gear installed on the Orient liner s.s. 'Orama.' During two voyages of a total distance of 44,000 miles the pump made 110,000,000 revolutions, and upon dismantling no appreciable wear could be detected. As may perhaps be gathered from Fig. 4, the majority of the pump parts are of circular form, and are thus quickly and cheaply produced.

"The principal advantages claimed for the pump are that it can be driven at a high speed, giving uniform and steady discharge under all pressures, it is perfectly balanced, has a high efficiency (shown to be 90 per cent. by experiment), it is compact and simple in construction, it is moderate in cost and weight, and is exceptionally durable. An interesting characteristic which should be mentioned also is that no special precautions need be taken to filter the oil used. The pump has been run long periods with oil containing dirt and grit, and upon being opened this has been found to become caked in the central pocket of the piston G, one of which is shown in Fig. 4. It should be stated that no packing of any kind is employed, and all the working parts are ground to fit, thus ensuring a minimum amount of oil leaking, and what leakage takes place runs through a groove in the cylinder body into the inside of the floating guide ring E, and afterwards passes through the bearings M into the main casing K, from which it is pumped into the main supply tank.

"In the type of transmission motor employed for driving the road wheels, Dr. Hele-Shaw has evolved one which alone can work efficiently, or even work at all, at the high speeds required for road locomotion, and for various other purposes to which it has been adapted. Its particular value and superiority to other hydraulic motors at present on the market lies in the fact that it can work without the shocks which occur in using high pressures with a reciprocating system in which air vessels are inadmissible. The characteristic features of this motor are covered by special patents,

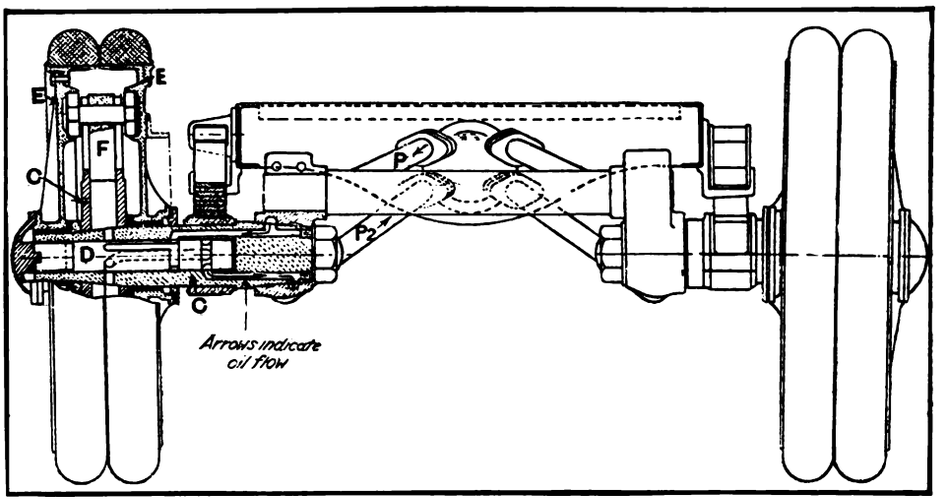


Fig. 6—Half-Sectional Drawing, Showing the Application of Dr. Hele-Shaw's Transmission System to a Motor Chassis Back Axle.

and are similar in certain fundamental respects to the Hele-Shaw pump, though differing from the latter in several important particulars. For instance, instead

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of revolving, the cylinder body can be held stationary whilst the cams (corresponding to the guide rings in the pump) together with cylindrical valve or 'D' tube

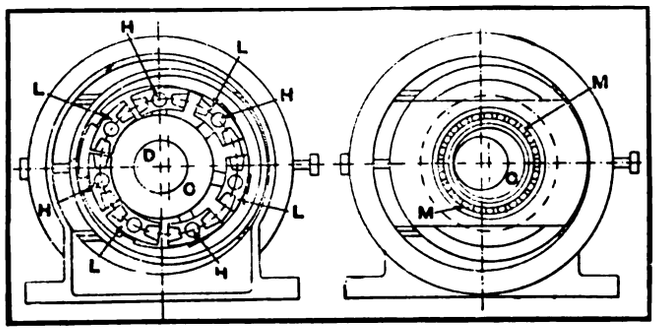


Fig. 7—Diagram Showing the Principle of the Hele-Shaw Transmission Motors.

are made to rotate. With this form of construction the rate of rotation of the valve can vary in relation to that of the cams, and the shape of the latter may be corrugated so that to one revolution of the motor any number of strokes of the hydraulic pistons may be obtained. A great turning effort can thus be secured without unduly increasing the proportions of the motor—an important consideration when the system is applied for driving the slow-moving wheels of road or agricultural tractors which are required to exert great tractive effort.

"In order to understand the action of the transmission motors installed in a motor chassis, the attention of the reader is directed to the drawing given in Fig. 6, which shows a section of one of the wheels and motors and a part of the axle. The oil is transmitted under pressure by the pump above described through the pipes P1 and P2, which are shown also in plan and elevation in Fig. 8, and communicate with a distributing valve D. The motor consists of a cylinder body C formed with six radial chambers provided with pistons, one of which is shown at F. Each of these pistons is fitted with a gudgeon pin carrying on its two ends roller bearings which run in the cam paths E E, formed in the sides of the wheel. The cams E are of elliptical formation, as shown in Fig. 7. It should be noted, however, that this figure gives sectional views of the type of hydaulic motor used for capstans, winches, etc., and is only given in order that the action of the motor as applied to road vehicles may be more clearly understood. The oil enters the distributing valve through six holes, one for each cylinder, and is distributed to the cylinders through four holes, which are so positioned that pressure is applied to those pistons whose rollers are at the moment bearing upon the oblique portions of the cams, with the result that the wheel is caused to rotate. The cams being elliptical in shape, two strokes of each piston per revolution is made. It should be stated, however, that the form of the cams has been derived by accurate plotting, and is such that complete balance of the working parts is obtained, and at the same time any shocks in the working system are entirely obviated. The cams also give a large lap in the valve action, and the loss by slip or leakage in passing from the suction to the pressure side is reduced to a minimum. The use of the cams enables the hydraulic motor to work under its full load, and at a high speed without injurious vibration, and without causing any serious fluctuation on the pressure gauge, even up to pressures of 1500 and 2000 pounds per square inch. This type of motor has been carefully tested with a dynamometer, and we are informed that, possibly owing to its running at a much slower speed than the pump, its mechanical efficiency has exceeded 95 per cent.

"At Fig. 8 we give general arrangement drawings, in plan and elevation, showing the application of Dr. Hele-Shaw's transmission to a three-ton motor chassis. In these the position of the pump, coupled directly to the engine, will be seen as well as the arrangement of the pipes which convey the working fluid from the pump to the road wheel motors, and also the oil supply tank. Two short pipes P and Q communicating with the 'D' tube or the central valve of the pump, are led to a junction box supported by a cross member of the frame. This box is provided with a tapered plug, terminating at the rear end of a ball universal joint U, from which the two long pipes P1 and Q1 are led to connections on the back axle through which the oil is supplied to the motors. The tapered plug is kept in position and kept oil tight by a single nut, and has channels leading to ports in the ball of the universal joint, thus providing a passage way for the oil in the pipes P1 and Q1. The short pipes P and Q are bent slightly, as shown in order to compensate for any relative movement between the pump and the universal joint. The latter, which is protected by patents, gives perfect flexibility, allowing any up and down movement of the back axle, whilst the long pipes P1 and Q1 perform the duties of torque rods. On the bottom of the main pump is provided another small pump, the function of which is to return any leakage of oil in

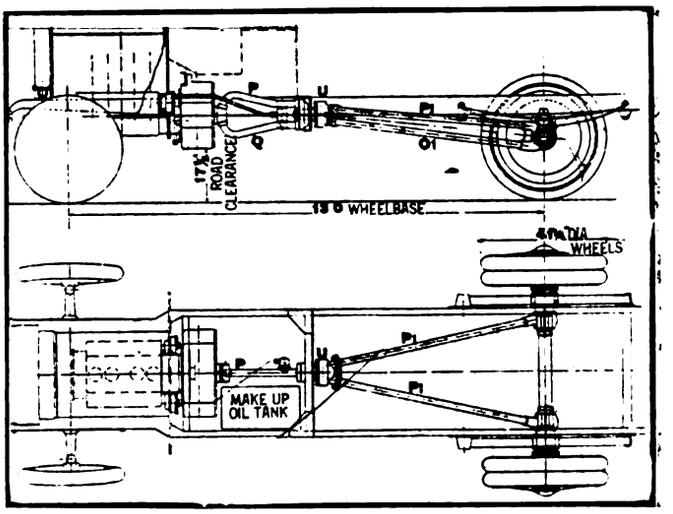


Fig. 8—Side Elevation and Plan Drawings Showing General Arrangement of the Hele-Shaw Hydraulic Transmission System as Applied to a Three-Ton Chassis.

the main casings of the main pump, and the road wheel motors to the oil supply tank.

"The movement of the guide ring of the main,

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pump that varies the stroke of the pistons is controlled by a small Hele-Shaw pump, which is brought into operation by a pedal. When the latter is allowed to rise to its highest position the guide ring is moved so that the working fluid is transmitted in that direction, which gives forward movement of the vehicle; when the pedal is fully depressed the reverse action takes place for the backward movement; when it is in the mid-position the guide ring is concentric with the central valve, so that the pistons have no radial movement and no oil is transmitted to produce either forward or backward travel of the vehicle.

"The chassis shown in Fig. 8 has been designed in accordance with the War Office subsidy scheme specifications, which demand a minimum road clearance of 12 inches; in the chassis under construction it will be seen that an extra 4.5 inches of clearance is obtained, whilst the only portion of the mechanism that projects above the top of the frame is the pipe P, and this becomes below the seat and is thus of no account."

PIERCE-ARROW IN MILK DELIVERY.

SOME interesting figures are made public by Towar's Wayne County Creamery, Detroit, which operates a five-ton Pierce-Arrow worm driven truck, made by the Pierce-Arrow Motor Car Company, Buffalo, N. Y., hauling milk, day in and day out. Two shifts of men are employed and the car leaves the garage at 3 in the morning, to return at 12 midnight, after 21 hours of work daily, except Sunday, when it is utilized only 12 hours.



Five-Ton Pierce-Arrow in Service with the Wayne County Creamery, Detroit.

The machine leaves the Towar plant every morning with a load of wholesale bottled milk and cream, which it distributes to the grocery stores and factory dining rooms on the east side of Detroit. It takes from 3 in the morning until 1 in the afternoon to peddle this load and make collections. The weight of the return load of empty bottles and crates is about three tons. It formerly took three teams and one single wagon to do this work.

At 1 in the afternoon it makes two trips to the railroad stations for milk, being loaded with five tons each trip. The second driver takes the truck at 2, and a journey to the north end branch, four miles away, is made, with a full load of bottled goods to be delivered the following day by the wagons stationed at this branch. On the return trip it has a full load of empty bottles weighing four tons.

A second round trip to this branch is taken before lunch at 6. Two more trips to the railroad depots for supplies follow lunch, then one trip to the east side branch, a total distance of 10 miles. Upon its return from the east side, there usually is another trip to the railroad station. These afternoon and evening trips are all five-ton loads with an occasional overload of half a ton. Mr. Towar estimates it would take at least five large teams to handle this afternoon and evening work, while now it is done with two men and the Pierce-Arrow truck. It will be seen that routes taken each day are practically the same, and the loads carried do not vary materially. Because of this condition it is possible to determine just what the truck is doing, how many wagons it has replaced and the daily mileage. No cost figures are given.

Ninety-five 10-gallon cans of milk is a load for depot hauling, a total of 10,450 pounds. The daily mileage of this truck is between 50 and 60.

A sample morning load follows:

Case Goods—	Cases.	Pounds Each.	Total Pounds.
648 quarts milk	54	59	3186
1800 pints milk	90	55	4950
100 half-pints cream	5	41	205
40 pints cream	2	55	110
60 quarts buttermilk	5	59	295
Bulk Goods—			
5 10-gal. cans milk	110		550
6 5-gal. cans milk	54		324
5 3-gal. cans milk	29		145
10 2-gal. cans milk	21		210
5 2-gal. cans cream	20		100
Total load			10,075

The city council committee of Beverly, Mass., recently voted to purchase a LaFrance combination hose and chemical wagon, made by the American-LaFrance Fire Engine Company, Elmira, N. Y. The money for the apparatus was appropriated several months ago and since that time the committee has witnessed tests and made inspections of several makes of machines, while a number were taken to Beverly for trial.

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SYSTEM IN ESTABLISHING SERVICE STATION.

WHILE it is admitted that in most cities, at least outside the larger centres, the use of the commercial automobile hardly has become sufficiently general to warrant the establishment of garages devoted exclusively to the care and maintenance of motor trucks, the time is not far distant when service stations of this character will be an absolute necessity. The far seeing business man, who desires to keep abreast of the situation, will recognize the truth of this assertion and begin to make provision for taking part in the development of a paying proposition.

——CONTRACT WITH OWNER——

The Eastern Garage & Service Company, in consideration of ..... dollars, hereby agrees to provide a weekly inspection, and to keep in perfect running order for one year from date, exclusive of the expense of new parts, the ..... ton ..... truck, kept at the garage of said service company, and owned by and operated under the direction of .....

Date .....

Signed,

.....For the Owner

.....Garage Representative

Suggested Contract Covering Full Service, Six Inches Long by Three Wide.

Those who have given the matter even casual study will agree that the manufacture and sale of industrial transports must be along altogether different lines than those which have marked the growth of the pleasure vehicle side. Indeed, it is now generally acknowledged that the conditions to be met in the satisfactory placing of commercial vehicles are being more or less reflected in the handling of automobiles devoted more largely to pleasure purposes. It is only within a few years that the service station, as it is now known, has come into vogue.

Many manufacturers are establishing factory branches in the principal centres, forcing their representatives in the intervening districts to adopt measures more in keeping with the service granted by these branches. In many instances this has meant the investment of larger sums on the part of dealers, but the return in added business has been such as to amply repay for the effort and attention.

If it is possible to increase materially the business done in the sale of pleasure cars through the establishment of service stations which guarantee to the owner that his machine shall be kept in satisfactory condition at a minimum of cost, it follows that the garageman who recognizes the full value of such an investment will be in a position to meet the demands for commercial motor vehicle service when the situation in his immediate locality reaches the point where someone must supply those needs.

The question of investment must be left to individual judgment, but it may be pointed out that it is possible to anticipate the need along this line. The garage proprietor who is firmly established in his community can easily work up a business of this character without feeling the added expense. The returns ought to be sufficient to more than offset the outlay, from the very beginning.

To cite a concrete instance, it may be stated that about two years ago a garage proprietor in southeastern Massachusetts adopted the policy of caring for his pleasure car owners so long as they were possessed of one of the machines represented by him. Not only does he maintain a system of periodical inspections, thus keeping the car in good order all of the time, but he undertakes to give it a complete overhaul at the end of each year, the charge for this service being $100. His sales have increased materially since this plan was put into operation.

With a business thus established it will prove surprisingly easy to so extend the service that it may include commercial motor wagons. It will be admitted that some sort of system is necessary, and as is true of every other feature of the garage business, this system should be as simple as practical results will permit.

For the purpose of further explaining the proposition contained herein it will be assumed that the Eastern Garage & Service Company has been established for some time, with a growing business in the sale of pleasure cars and an agency for some well known motor truck. It follows that it has a thoroughly equipped repair department, a well lighted shop and abundant facilities for undertaking all manner of automobile work.

The location is in a city of moderate size, in which the business men are beginning to appreciate the worth of the motor truck. The Eastern Garage & Service Company believes that the future presents excellent possibilties and that the local business men need the right kind of encouragement at this critical period. Incidentally, it may be remarked that this concern does not feel that the particular make of industrial transport represented by it occupies a position

——CONTRACT WITH OWNER——

The Eastern Garage & Service Company, in consideration of ..... dollars, hereby agrees to provide a weekly inspection, and to keep in perfect running order for one year from date, exclusive of the expense for new parts, the ..... ton ..... truck, owned and operated by ....., and kept at the latter's garage, said truck to be delivered at garage of Eastern Garage & Service Company for the inspection and necessary repairs.

Date .....

Signed,

.....For the Owner

.....Garage Representative

Suggested Contract Covering Weekly Inspection, Six Inches Long by Three Wide.

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TRUCK INSPECTION BLANK

Owner R. H. Peabody Co. Make of Truck Peerless Inspected June 27 1912

Type Gasoline Motor No. 10,984 Capacity 2 Tons

Odometer Readings 4,506 Tires Goodyear Type Wireless

Date of Last Inspection June 19-1912

REMARKS

1 Hand brakes need adjusting
2 Chain too tight – slacked the same at once
3 Motor – Connecting rods and main pins need adjustment
4 Carbon should be removed and valves ground
5 Ignition spring clip.
6 Grease cup missing on left steering knuckle bolt
7
8
9
10

DRIVER Frank Jones INSPECTOR E. J. Wood

Inspector's Report Blank, Eight by 10 Inches.

so unique that the product of no other manufacturer shall be considered.

As has been outlined, the concern has the necessary equipment and the opening is one which it is able to meet in a satisfactory manner. Naturally, it offers its customers garage service in its building, where the trucks sold by it may be cared for by men thoroughly acquainted with these vehicles. Perhaps it ought to be suggested that these quarters are too limited to admit of taking all the cars which might be brought to it, and as the business has not yet been developed it will be unwise to add further to the investment at this time. Moreover, there are certain business men who prefer to garage their own trucks, and for these the Eastern Garage & Service Company offers a specified service which should prove attractive.

The two contracts accompanying this discussion set forth in simple language the two types of service. In either case, the truck, no matter what the make, receives periodical and expert inspection. The character of this must be such as to keep the car in perfect working condition. A suggested inspection report is presented, and it may be added that the original is filed in the office of the service station, while a copy is forwarded to the owner of the vehicle.

The contract specifies what repairs shall be assumed by the company. It is bound to make such adjustments at once, but if the report indicates that work not covered by the contract is required, the owner is apprised of this, and can use his own judgment in the matter. It hardly will be expected that such repairs will be delayed longer than absolutely necessary.

Of course, efficiency plays an important part in the practicability of the commercial vehicle, and the owner desires to know just how long his machine is to be kept out of service. This is a point upon which the motor truck service station must be even more particular than is true where pleasure vehicles alone are considered. If possible, a time should be set at which the owner may expect to receive his car and every effort should be made to make delivery as promised.

Having assumed that the inspector has discovered necessary work and that the owner has ordered this done, the office force makes out the accompanying repair ticket, which is attached to car on the floor. The repairman is thus informed as to what is required, and no time is lost in going over the machine. All this makes for efficiency, and guarantees to the owner that his vehicle will not be out of service unnecessarily.

Of course, it might be possible that certain repairs would escape detection even by the expert inspector, and such will develop only after the car is dismantled in the shop. Whenever such work is found the owner should be notified at once. This holds true of all repair work, but more particularly with the business man who is depending upon his motor truck. It is not to be assumed that the owner will desire to avoid making necessary repairs, but he must be considered, especially when his business is at stake. He is best able to judge whether it is practical to have the work done at this or some other time.

The obverse side of the repair ticket shows what work is to be done. The reverse has space for noting

REPAIR TICKET

Machine Peerless Truck Owner R. H. Peabody Co

Received June 27-12 Promised 4 P.M. June 29

Start	Finish
6:28 10:30 A. M.	6:28 12:00 M.
6:28 1:05 P. M.	6:28 3:20 P. M.
6:28 4:05 P. M.	6:28 5:10 P. M.
6:29 8:15 A. M.	6:29 8:25 A. M.
6:29 2:15 P. M.	6:29 3:35 P. M.

Total Time 6 hours 20 mins.

NEW PARTS.

One Grease Cup

Repairman A Ames Foreman Johnson.

Reverse Side Repair Ticket for Checking Time.

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EASTERN GARAGE & SERVICE COMPANY

Stock Requisition Date 6/29/12

Part No.	Model	Quantity		Price	Am't
47		2	Connecting rod bolt nuts	.10	.20
		24	cotter pins		.12
		2	taper pins	.05	.10

Repairman A. Ames Foreman Johnson

Stock Requisition, Four Inches Long by Two Wide.

EASTERN GARAGE & SERVICE COMPANY

Credit Voucher Date 6/29/12

Part No.	Model	Quantity		Price	Am't
		1	taper pin	.05	.05

Repairman A. Ames Foreman Johnson

Credit Voucher, Four Inches Long by Two Wide.

the amount of time expended upon the vehicle. This is a feature which deserves careful attention. Every garageman knows from experience how difficult it is to convince an owner that the amount of time for which he has been charged actually has been expended on his car. To overcome this difficulty, some scheme must be devised whereby the garage proprietor can show absolutely just how the time of all of his workmen has been employed. It will be admitted that the time clock solves this problem.

The repair ticket should be so constructed, of moderately heavy material, that when the repairman begins work on a given truck he can slip the ticket into the time clock, thereby recording the hour and minute at which he began operations. Whenever he is called away, no matter for what purpose, he should first visit the time clock with his repair ticket, as a result of which when the work is finished he will have a complete record of the job, to which the owner may have access whenever he wishes. Not only will this method tend to eliminate all possibility of dispute, but it will afford the office ample opportunity to check up the daily time of the workmen, thereby simplifying the work of the bookkeeping department.

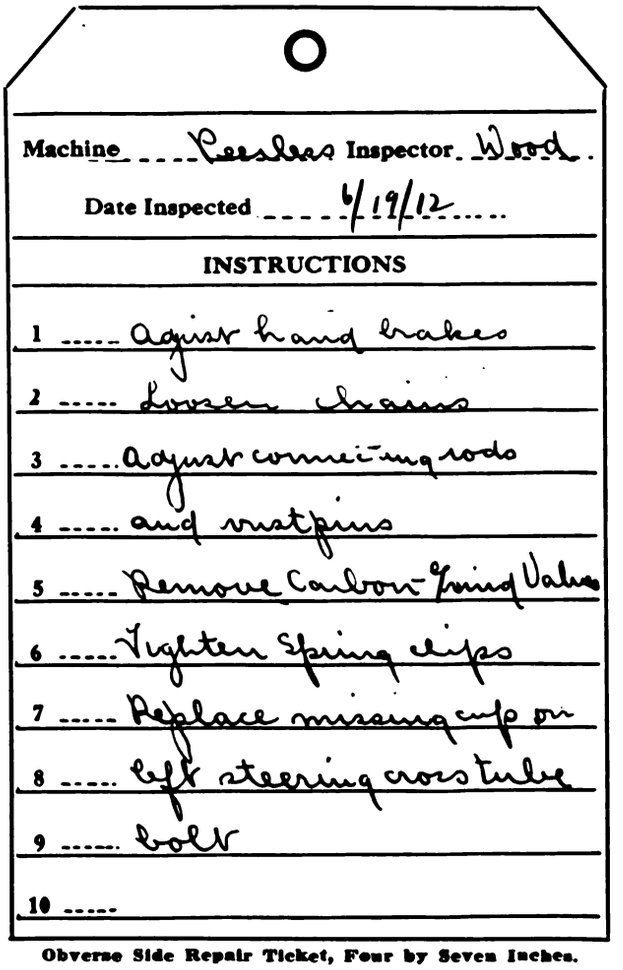
This is a part of the system, which should be applied to the entire work of the garage or service station. It is quite as essential to convince the owner of a pleasure car that he has not been overcharged in this respect. And it may be added that the last set of blanks presented herewith also is adaptable to any line of repair work.

As the business of the concern grows it will become more and more evident that some system of checking up the supplies must be adopted. Under ordinary circumstances it will be found quite sufficient to make the foreman responsible for the stock room. All goods should be kept under lock and key, and when a workman requires any spare part, for instance, a simple form of requisition should be filled out. Provision also must be made for returning goods which are later found not to have been needed. A credit voucher, like that shown, solves this problem.

It may be said in passing that the system outlined for the Eastern Garage & Service Company is adapted from one which has been employed by a factory branch in one of the larger cities for the past two or three years. It has the advantage of being exceedingly simple, yet entirely sufficient for all needs. By its use the garage proprietor is able at any time to gain information concerning every detail of the business.

The weekly inspection reports keep him in close touch with the owners; the repair tickets show just what work was done, how long it took and how his workmen's time was employed; the requisitions, properly checked up at stated intervals, indicate the condition of the stock room at all times.

While an attempt has been made to indicate how an established service station may take the initial steps to secure added business, which later will supply a substantial portion of its income, practically all of the system will be found applicable to the average garage and repair shop. The need for some such suitable check on the various departments is being realized more and more, and the suggestions offered herein will be found of distinct value in working out a plan to meet individual needs.



Obverse Side Repair Ticket, Four by Seven Inches.

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New Commercial Car Accessories

B. & S. Master Vibrator.

The B. & S. master vibrator, manufactured by the Briggs & Stratton Company, Milwaukee, Wis., is designed to synchronize the ignition of a multiple cylinder motor by utilizing one vibrator instead of two, three or four. The device is small and compact, being 5.25 inches high and 2.5 inches in diameter, and is water and dust proof.

Wisco Grease Gun.

The Wisco grease gun, made by the Wilson Instrument & Specialty Company, Passaic, N. J., is produced in different styles and is designed for both oil and grease. A feature of the device is the fitting of a flexible snout by means of which the most inaccessible places may be lubricated easily, the nozzle being capable of being turned through any angle from zero to 90 degrees.

Ray Socket Wrench.

Socket wrenches are a valuable addition to the tool kit or garage as with these members nuts and bolts difficult of access are reached and adjusted easily. The Packer Auto Specialty Company, Chicago, is marketing the Ray socket wrench which is made in two sizes and includes sockets made of pressed steel, cold drawn and case hardened. The kit also includes screw drivers, universal joint device, etc. The wrench itself is of the ratchet type, nickel plated and polished.

Morgan Utility Tool.

The Morgan utility tool is manufactured by B. Morgan, Newport, R. I., who has marketed a number of practical accessories. The device comprises two slotted jaws, one of which is securely fastened to a threaded bolt while the other member is actuated by a ratchet. This arrangement permits of contracting or compressing the jaws when replacing or removing valve springs.

Victor Grease Gun.

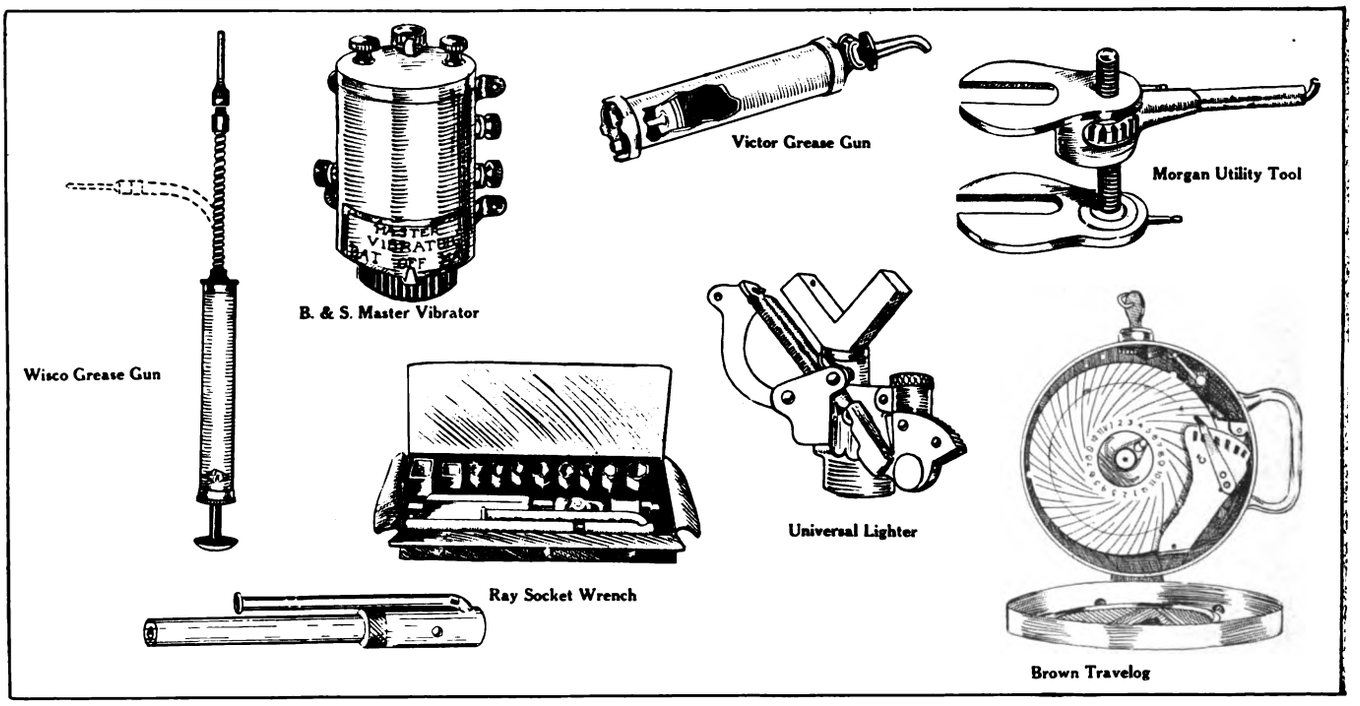
The Judd & Leland Manufacturing Company, Clifton Springs, N. Y., has brought out a grease gun that differs from those of usual construction inasmuch as the device not only holds considerable lubricant, but the latter is injected into the differential or other part by compressed air. A large aperture permits of easily filling after which a few strokes of a tire pump produces sufficient compression to force the grease to the desired part, the operation involving the turning of a pet cock.

Universal Lighter.

The Universal Lighter being marketed by the Waite Auto Supply Company, Providence, R. I., is a device for igniting the acetylene gas at the headlights. The service of current or wires is eliminated as the spark is generated by a friction file passing over a sparking alloy, and it is claimed that the latter is very enduring and inexpensive.

Brown Travelog.

The Brown travelog, brought out by W. H. Brown, Cleveland, O., is a clock-like device containing a chart on which is recorded the performance of the machine such as starting, stopping, time of runs, etc.



Practical Accessories of Interest to the Owner, Driver and Repairman, Including Novel Grease Gun, Utility Tool, Universal Lighter, Brown Travelog, Etc.

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FIRE DEPARTMENT NOTES

FOUR-WHEEL DRIVE FOR WEBB.

Special Advantages Claimed for Couple-Gear Equipment on Fire Apparatus.

While the Couple-Gear Freight-Wheel Company of Grand Rapids, Mich., is engaged in the manufacture of electric and gasoline-electric trucks, including fire department equipment and other municipal service wagons, it maintains that the chief essential of its products is to be found in the wheels. An accompanying illustration shows a Webb aerial ladder wagon, made by the Webb Motor Fire Apparatus Company of St. Louis, Mo., utilizing the 3.5-ton parts produced by the Couple-Gear people.

The wheel itself is of hollow metal and carries the driving electric motor inside. In this particular wagon the gasoline-electric system is employed, by which is meant that a gasoline motor is utilized to develop current which is distributed to the individual electric motors within the wheels proper. It ought also to be said that another electric motor and gears are so disposed as to be utilized in raising and lowering the ladders.

The driving force is applied to each of the four wheels at two opposite points, with a balanced division of the work accomplished by the two driving pinions, one on either side, this being effected by a simple rocker device called an evener. These two driving shafts constitute an extension of the motor armature in opposite directions, and carry small bevel pinions, which mesh with very large bevel gears attached to the exterior metal casings of the wheels. One meshes with the inside gear and the other with the outside, the armature shaft being set at a slight angle to permit such action. This gives the same direction of rotation to both parts of the wheel, while the same sized pinions and gears and like prolongations of the armature result in producing exactly similar speeds. This is necessary, as otherwise the two sides of the wheels, attached together at some points, would be driven at differing speeds, resulting in breakage as soon as power was applied to them.

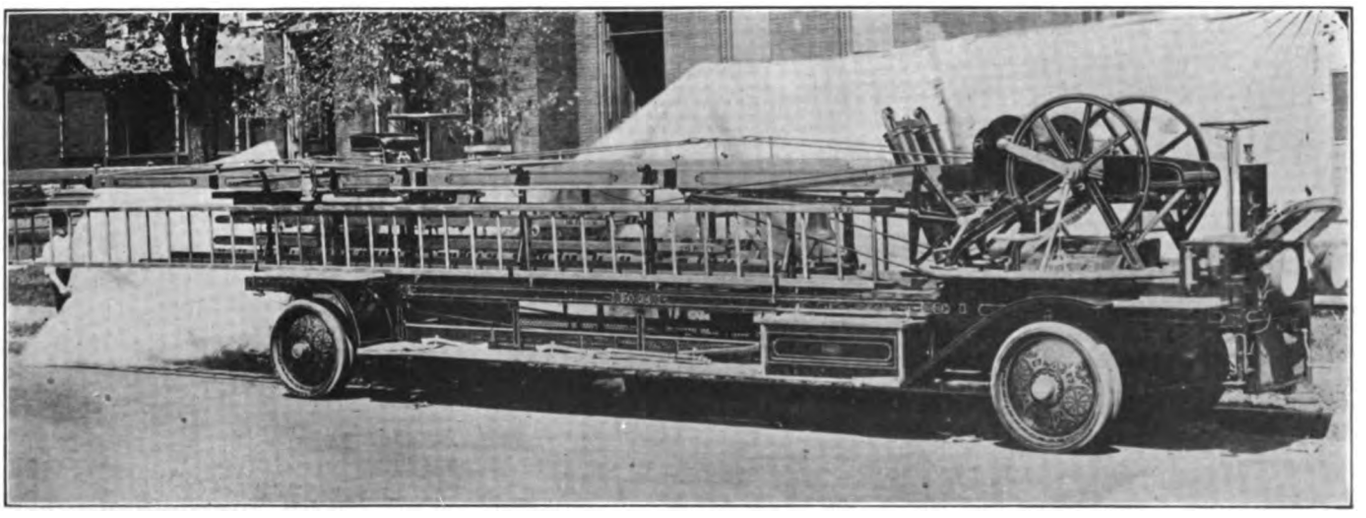
A further peculiarity is to be noted in the method of attaching the axle stub on which the wheel turns, this being made integral with the motor casings within, so that an elongation of the inside stub, keyed to the taper sleeve in the steering knuckle holds the motor in position. This insures that this member shall be held horizontal while the wheel revolves around it. The same construction allows of the wheel being turned around the knuckle pivot without interfering with the motor action or the transfer of the electrical current to the motor. Inasmuch as this construction is the same for all four wheels, it permits four-wheel steering and driving. The advantage of this method lies in the superior traction obtained.

FEDERAL COMBINATION WAGON.

An Equipment Designed to Meet Distinct Needs of the Smaller Municipalities.

A combination hose and chemical wagon, the apparatus having a Federal one-ton truck chassis, has just been delivered to Middleboro, Mass., for the fire department of the town, the sale having been made by the Whitten-Gilmore Company of Boston, New England agent for the Federal Motor Truck Company, Detroit, Mich. The body was designed and constructed, and the equipment was provided by the Monahan Vehicle Company, Providence, R. I.

It is claimed by the body maker, and by the agent for the vehicle, that the apparatus is not only in every



Webb Aerial Ladder, Fitted to 3.5-Ton Gasoline-Electric Chassis, Utilizing Couple-Gear Wheels and Motor Equipment.

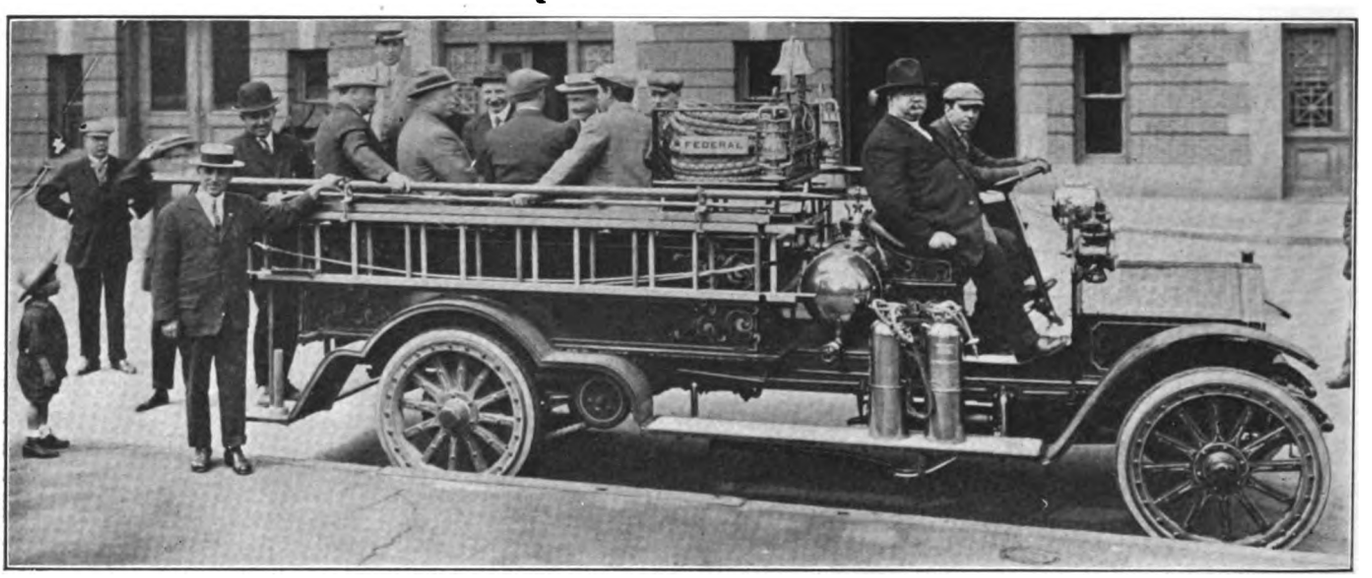
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way complete and up-to-date as measured by fire department requirements, but the price is exceedingly moderate, so that equipment of this character may be within reach of the comparatively small municipality or fire district, wherever there exists a hydrant system. The chassis is a Federal model D, which has a wheelbase of 144 inches, and a weight of 3300 pounds. The chassis is in every way the Federal standard with L head type of four-stroke cycle, water-cooled motor, rated at 30 horsepower by the manufacturer, this being a conservative estimate. The bore is 4.25 inches and the stroke is 4.5 inches, the cylinders being cast in pairs with the water jackets integral. The engine is designed for heavy duty and it is given its rating at a maximum of 1000 revolutions a minute, it being fitted with a governor that is set for a speed limitation, and the minimum engine speed is from 175 to 200 revolutions a minute.

It is claimed for this engine that it is particularly adapted for fire department service because of its flexible. The motor is lubricated by splash from constant levels maintained in oil pits in the bottom of the engine case by a gear driven pump, the lubricant being filtered before it is drawn through the pump and distributed through the system.

The drive is by a leather faced cone clutch through two universal joints and a shaft to a selective sliding gear transmission, giving three forward speeds and reverse, the gearset case being supported forward by a bracket centred in a cross frame member, and being bolted to the jackshaft housing. The jackshaft shell is supported by globe bearings carried in brackets on the frame side members. The transmission, or the transmission and jackshaft, may be taken out without disturbing the power plant. The drive is by double side chains to wheels mounted on a dead rear axle. The radius rods are of a design to preserve the relation of the rear axle and the jackshaft and relieve the springs of all driving strains.

With the chassis adapted for fire department pur-



Federal One-Ton Chassis, Equipped as Hose and Chemical Apparatus by the Monahan Vehicle Company, Providence, R. I., Delivered to the Town of Middleboro, Mass.

design for hard work and service reliability, the ignition being an Eisemann high-tension magneto, there being no spark advance. So efficient is the ignition that a quarter-turn of the crank will start the motor under practically all conditions. The gasoline supply is fed by gravity, the carburetor being adjusted for a fuel level at the factory, and it is claimed that the highest efficiency may be obtained with the use of the foot accelerator, there being no throttle lever.

The power plant, which includes the clutch assembly, is installed at the forward end of the chassis frame, the engine being supported on four large cored arms that are bolted to the frame side members. The radiator is mounted on brackets that are carried on solid guides, between helical springs, the guides being bolted to the chassis frame. By this construction the radiator is not subjected to any of the stresses of chassis twist or distortion. The connections between the motor and the radiator are extremely large and

poses the engine speed reduction is to afford a maximum of 30 miles an hour vehicle speed. The drive is at the left side and the control levers are for the left hand, so that driving through traffic the roadway is seen to the best advantage and there is no need for a driver to remove his right hand from the steering wheel.

The body is deep, with two hose crates, open at the rear ends and at the sides, the cover or top of the crates forming the seats for the firemen. The leg room between the crates is 11 inches in width. The crates have a capacity for 1000 feet of regulation fire hose, this being packed coupled, 500 feet at either side. At the inner side of the crates are rolls to facilitate handling and prevent wear of the wood when laying the hose. A brass rail surmounts the sides and at the rear curves downward and ends at the wide step extending the width of the entire vehicle. There are two single handles at the inner sides of the hose crates to con-

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venience the firemen entering or leaving the machine while it is moving.

Above the forward end of the body on stout brackets is the basket of heavy wire containing 150 feet of chemical hose, and above this basket is suspended a bell of the locomotive type, which may be rung from the body or the driver's seat. At either side of the bracket, at the front corners, is a hand lantern. These are held by clamps and are instantly detachable. At either side of the body is a 25-foot extension ladder, and a 16-foot pike pole. At either end of the rear running board is a hose nozzle. Forward of the body and behind the seat of the driver is the Badger 40-gallon chemical tank, with a large filler cap at the centre. The control of the tank and the outlet, the gauges and the valves, are at the left side. The fuel tank is beneath the driver's seat, which seat may be lifted on hinges to permit filling. On the left side of the seat is the bulb horn. Two oil lamps are mounted at the sides of the dash, and in the centre of the dash is a large swivelling search lamp that is lighted by acetylene gas from a tank. This gas tank and two hand fire extinguishers are mounted on the right running board. The other equipment of the apparatus includes a crowbar, axes, cotton hooks and the usual tools that are carried.

The front fenders are of the usual type, but long and sweeping, and the side running boards are fair length, the rear fenders being of scroll form to protect the body and they extend from in front of the jackshaft to the rear running board. On the left running board is the long tool box. The wheels are shod with cellular solid tires. The centre of gravity of the vehicle is low and it is claimed to be practically free from side sway.

The apparatus is painted vermillion and decorated with gold leaf and is decidedly attractive. After its delivery by the body builder to the representative of the Whitten-Gilmore Company at Providence it was demonstrated to the officials of the fire departments of Providence and Pawtucket, and the accompanying illustration was made just as the Pawtucket delegation, headed by Chief Butler and consisting of the city council committee on fire department, was starting for a tour of the different fire stations in Providence, the purpose being to show the machine to all the firemen of that city. Later it was similarly demonstrated in Woonsocket, R. I., Attleboro, Mass., and other towns and cities where the municipal authorities are interested in fire equipment, and where it was given a decided attention.

HORSES FAIL IN SPRINGFIELD.

Series of Alarms During Heated Period Demonstrate Value of Motor Apparatus.

Several New England cities have been visited by an incendiary recently, Waterbury, Conn., and Worcester, Mass., being the first sufferers. July 5, in the midst of the extremely heated period, Springfield, Mass., experienced 14 fires between 12:30 and 3:45 in the afternoon, most of them apparently being of incendiary origin. Nearly all of the fires were in the district bounded by the Arch, Carew and Chestnut streets, and the Connecticut river. Once or twice two alarms came over the wires almost simultaneously.

As is well known Springfield is plentifully supplied with motor fire equipment. The only horse drawn apparatus to answer these alarms was that stationed at the Hooker street house, and the horses were unable to respond to the third alarm, on account of the weather. The Knox and Couple-Gear equipment at the other houses answered all alarms without difficulty, the only financial loss for the total of 14 fires being in the Sacred Heart church, where choir vestments valued at $500 were destroyed.

PUMPING ENGINES IN PANAMA.

Two of Webb Manufacture Undergo Satisfactory Trials in the Canal Zone.

The Panama Canal authorities recently received two motor fire engines from the Webb Motor Fire Apparatus Company, St. Louis, Mo., which have been placed in commission at Ancon and Cristobal. The machines, according to the Canal Record, were subjected to tests under the direction of the mechanical engineer and the chief of the Canal Zone fire department and were not found wanting in any manner.

One of the engines on a test run covered 7.9 miles in 25 minutes where sharp turns and heavy grades were encountered. The engines are of six-cylinder type, 80 horsepower, and must be able to run 50 miles an hour on a level road and 20 miles an hour on a 12 per cent. grade. Each machine carries 1200 feet of hose, and is supplied with a roof ladder, extension ladder and two three-gallon fire extinguishers. The pumps have shown a capacity of 690 gallons of water a minute through two 300-foot lines of hose with 1.25-inch nozzles.

The Canal Commission, Washington, D. C., made a requisition some time ago for the purchase of a motor tractor to take the place of horses in drawing the No. 3 Silsby fire engine, stationed at Cristobal, but the bids failed to show where it would be practical, and the idea has been abandoned for the present.

KISSELKAR MAKES FAST TIME.

Develops Remarkable Speed in Official Test Before Being Placed in Service.

An accompanying illustration presents the Kissel-Kar fire wagon, made by the Kissel Motor Car Company, Hartford, Wis., and recently placed in service with the New Orleans department. It is fitted with a 53 horsepower engine and is guaranteed to make a speed of 50 miles an hour. As a part of its official

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test, the machine was given a three-mile run under the direction of Chief Louis Pujol. During this it was forced to halt four times on account of other vehicles being in the way, and to make four turns that were decidedly dangerous. Six and one-half minutes after it left the house it was throwing water three miles distant.

The car will be in charge of Auto Hose Company No. 1, the members of the crew being as follows: Captain, John Ward; lieutenant, Victor Legarde; hosemen, E. Raymond, J. Dutal, George Monier and R. Sanders.

FIRE NEWS FROM MANY CITIES.

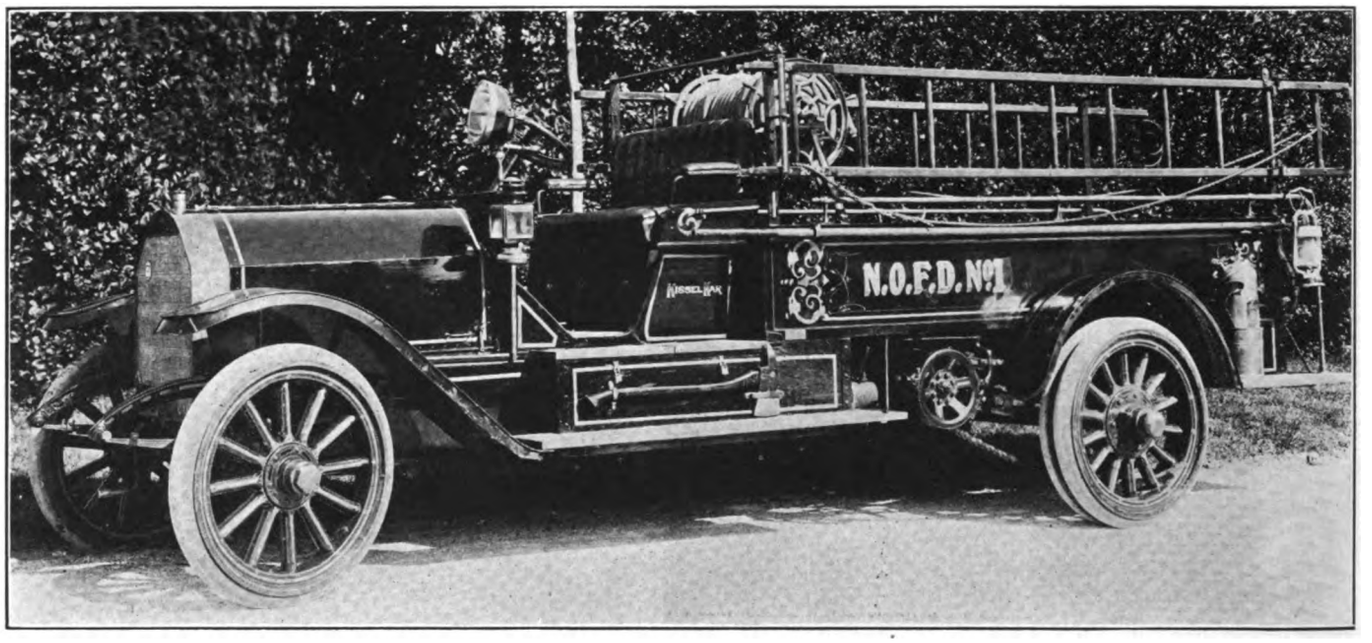
Will Pass on Bids—Prof. Charles E. Stewart of Tufts College, Medford, Mass., and also of the faculty of the Franklin Union, Boston, has been appointed by the finance commission of Boston, to act in an advisory capacity in passing upon bids for fire apparatus purchased by the city.

Macks for New York Department—The New York City fire department commissioners recently awarded the International Motor Company's New York branch the contract to supply the city with five two-ton chassis, mounting combination hose and pumping engine bodies for the suburban service of the department. They will be of the Mack type, and are to be delivered within four months. Five leading makers of trucks and motor fire fighting apparatus made bids for the contract.

Knox Given Severe Test—The Knox automobile chemical, made by the Knox Automobile Company, Springfield, Mass., stationed at what is known as the Tower Hill station in Lynn was recently subjected to a severe test. Without any intimation of what he intended to do, Mayor Connery ordered the machine from the house, and once outside announced his intention of trying to climb to the top of Newall Heights, the greatest elevation in the city. A doubt had been expressed a number of times as to whether the city had a machine in any of its departments that could make the hill, but the Knox, with Fireman Avery at the wheel, and containing the mayor, Chief Harris and a newspaper man, made the climb without any difficulty whatever.

Motor For East Liverpool—The mayor and city council of East Liverpool, O., have recommended the purchase of automobiles for the fire department. It is proposed to secure a car for the fire chief, a triple combination engine, hose and chemical wagon for the central station and motor trucks for three outlying fire stations. It is believed that at least $2400 annually can be saved by motorizing the department.

All But Four Horses Gone—But four horses will be left in the San Diego, Cal., fire department service when the motor equipment, for which the people voted $80,000 at the last bond election, is installed. The new apparatus will do away with 28 horses in the department. Those that remain will be used on supply and fire alarm wagons.



Fifty-Three Horsepower KisselKar Fire Wagon Recently Placed in Service with the Department in New Orleans.

New Machine for Boston—The Boston, Mass., protective department is to receive another addition to its motor driven apparatus this being a special 1.5-ton truck of 40 horsepower. The machine will be equipped with an electric lighting system and a self-starter. It will accommodate from 12 to 20 men, and will have room to carry 28 rubber covers in addition to its regular equipment.

Springfield Has New Ladder—The Springfield, Mass., fire department has another electrically propelled ladder truck similar to the one which has been stationed at headquarters for some time. The new ap-

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paratus cost approximately $10,000, it is stated, and has been installed in the new Pine street station, affording better protection to that district, which heretofore relied upon horse drawn equipment. The new machine is of the Couple-Gear storage battery type, made by the Couple-Gear Freight-Wheel Company, Grand Rapids, Mich.

Leavenworth Wants Motors—Following a visit to Kansas City, Kan., recently, where they watched tests and demonstrations of motor fire apparatus in use there, Fire Commissioner Dolde, Mayor Doege and Chief Bahler of Leavenworth, Kan., decided that their city would need at least two pieces of modern fire fighting apparatus this fall, and have advocated the expenditure of $10,000 for their purchase. The money will be raised, if necessary, by some kind of special levy.

American-La France in Maryland—A new 110 horsepower machine made by the American-La France Fire Engine Company, Elmira, N. Y., was recently placed in commission by the county commissioners of Baltimore county, Maryland. Following a test, the machine was sent to Catonsville, and the 70 horsepower vehicle which has done service there, was transferred to Gardenville. The new apparatus is capable of making 70 miles an hour. It is a combination chemical and pumping engine, the same power that operates the engine being used to operate the pumps. The car is of six-cylinder type, and is equipped with 1500 feet of 2.5-inch hose, 20 feet of five-inch suction hose, a 40-gallon chemical tank, 200 feet of one-inch chemical hose, three extinguishers, one 22-foot extension ladder and one 12-foot roof ladder. The engine capacity is 800 gallons a minute through three lines of hose.

Altoona Buys Knox—Altoona, Penn., recently closed a deal with General Agent Harry Silverman for the purchase of a Knox combination chemical and hose motor truck, made by the Knox Automobile Company, Springfield, Mass. The machine is to be delivered within two months, and its purchase is the first step toward the ultimate motorization of the entire fire apparatus of Altoona.

Victor Apparatus in Pueblo—Pueblo, Col., recently purchased a combination fire engine, made by the Victor Motor Truck Company, Buffalo, N. Y. Many changes will result from the installation of the new machine. It will replace six horses, three pieces of horse drawn apparatus, including a steam engine, an aerial truck and a hose wagon, and cause a reduction in the force at the engine house where installed from eight to six men.

Philadelphia to Motorize—Steps toward the motorization of the entire equipment of the Philadelphia, Penn., fire department are being taken by Director Porter of the fire bureau. Bids have been asked for 12 motor cars to be used by the chief of the bureau and his 11 assistants. These are to cost approximately $40,000. Bids are to be asked for tractors for a water tower and a hook and ladder, and estimates have been asked for a new hook and ladder. The installation of the motor apparatus will necessitate a reorganization of the department.

Poughkeepsie Buys White—A 40 horsepowr combination chemical and hose wagon, made by the White Company, Cleveland, O., was recently bought by the fire department officials of Amsterdam, N. Y. The apparatus will be constructed along lines similar to those of the machines in service in Mt. Vernon and Poughkeepsie.

Chicopee Favors Home Product—Mayor Rivers and Chief Pomphret of the fire department in Chicopee, Mass., are contemplating the purchase of a chief's wagon from the Stevens-Duryea Company of Chicopee Falls. It will carry chemical tanks and other fire fighting equipment.

In the Market—Among some of the cities contemplating the purchase of motor fire apparatus might be mentioned the following: Minneapolis, Minn.; St. Paul, Minn., to consider motorization of entire department; Milwaukee, Wis., common council recommends purchase of combination hose and chemical; Grand Rapids, Mich., to open bids for a number of pieces; Butte, Mont.; Council Bluffs, Ia., anticipates purchase of several pieces; fire committtee, Athens, Ala., inspecting apparatus with view to purchase; Tampa, Fla., two hose and chemical trucks; Gaffney, N. C.; Reading, Penn.; Canton, O., asks bids for seven pieces; Alhambra, Cal.; Echo Park, Cal.; Tekaham, Neb.; Delaware, O.; Beaver, Penn.; Norristown, Penn.; West Chester, Penn.; Jackson, Tenn.; Memphis, Tenn.; Abilene, Tex.; San Diego, Cal.; Coffeyville, Kan.; Lansing, Mich.; Easton, Penn.; appropriation of $5000; Mansfield, O.; Superior, Wis.; Iowa City, Ia.; Anaheim, Cal.; Peobody, Kan.; Mansfield, O.; Highland Park, Mich.

TENTH REPEAT ORDER FOR ALCOS.

The American Express Company recently placed its 10th repeat order for Alco trucks, a source of considerable gratification to the maker, the American Locomotive Company of New York City and Providence, R. I. The contract specifies a fleet of five of 3.5 tons rating for the New York service. The new machines, equipped with standard express bodies, will be placed in the heavy duty work. Their routes will include night trips between the express company offices and various shipping terminals, in addition to a regular day schedule. The express company has found the trucks a saving over horse drawn equipment, and during the past three years has added 46 Alcos. An experience in connection with one purchase of three trucks was the operation of these in the company's Chicago branch. The net earnings for the motor vehicles in eight months were $5747, an average of $1915.66 for each truck. A comparison of the cost with horse drawn vehicles resulted in favor of the motors, while the service was considered much more efficient.

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HINTS·FOR·PROPER MAINTENANCE

A Department for the Owner, Driver and Repairman.



RENOVATING OLD LUBRICANTS.

By careful attention to small details the manager or proprietor of the repair shop can effect a decided saving in expenses during the year. It is surprising to note the amount of lubricating oil that is wasted in the average shop and that more devices have not been developed for economizing the lubricant. Many workmen make it a practise when overhauling a mechanical transport to throw away the old oil, and this habit is not confined alone to the repair shop, but prevails in many private garages and service stations. In the course of a year this waste amounts to a considerable total and the greater portion of the oil could be saved if filtered properly.

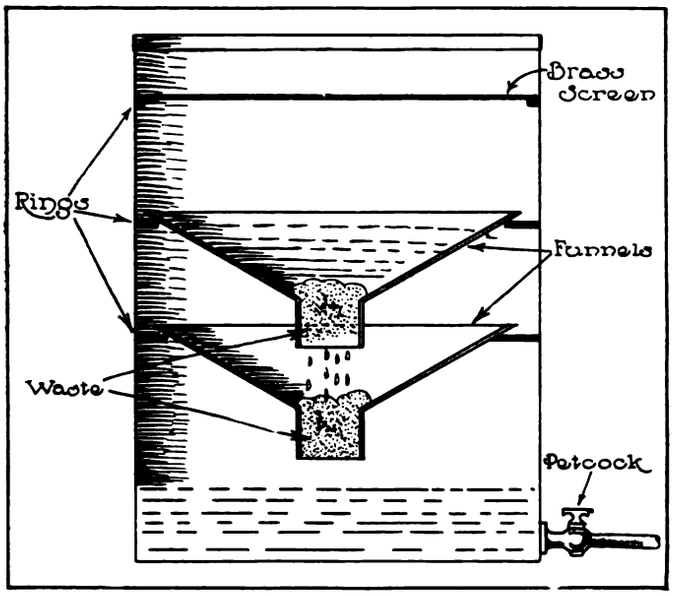


Fig. 1—Oil Filter Devised by Owner of Repair Shop, Which Saves Lubricant Formerly Thrown Away.

One manager of a large repair shop who watches small details very carefully to keep down the overhead expense, devised a filter which, he states, proved practical and was the means of saving many gallons of lubricant during the season. The device is depicted at Fig. 1 and consists of a round tank, a fine mesh brass screen, two ordinary tin funnels, an extra vessel, some metal tubing and a petcock. The container outlined was a five-gallon can the top of which was removed.

Three projections were soldered to the walls of the container to support each funnel and the screen. The bottom of the tank was drilled and a .25-inch copper tube soldered and led to the extra vessel conveniently located. A petcock was installed in the line so that the dripping oil might be shut off while the receiving member was being cleaned.

When the old oil is poured in at the top of the tank the wire screen separates bits of metal and foreign elements and the lubricant flows to the first funnel, being filtered by the loose waste. Thence it passes to the second member where the process is repeated. The filtered oil is remarkably clear and the inventor of the device states that he utilizes it in his car where it has given satisfactory service.

DRILL PRESS HINT.

When a piece of work is so small or of such shape that it cannot readily be bolted to the drill press table it can be kept from turning by placing a stiff piece of emery cloth between it and the table.

CONVERTED WING NUT.

Wing nuts are useful devices, as these members facilitate the removal and replacement of parts about the automobile and its accessories. A simple method of converting ordinary nuts into wing members is illustrated at Fig. 2 A. It consists of drilling two holes in the nut and driving a staple through the openings, peining over the ends of the staple. The latter should be long enough to pass through the nut as well as to provide means for rotating it.

HOME MADE MICROMETER.

Many operators of commercial vehicles are clever at constructing mechanical devices which facilitate the maintenance of the car and an instance is noted of a driver who produced a micrometer, a useful tool when fine measurements are to be made. The frame was cut from heavy sheet metal and to the shape depicted at Fig. 2 B, the end being rolled over to form openings .25 and .375 inch outside diameter. A piece of brass tubing, .375 inch outside diameter and two inches long, was fastened securely to the larger opening. On

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the other end of this tube was brazed a nut tapped with a .25-inch tap, having 40 threads. The sleeve was made of another piece of tubing large enough to go

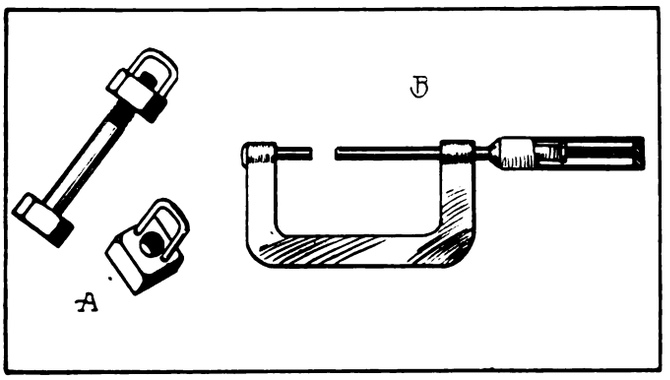


Fig. 2—Some Repair Shop Suggestions: A, Converting Ordinary Nut into Wing Member; B, Home Made Micrometer.

over this nut. Next a bushing was fitted in one end of this sleeve and the other beveled to about 45 degrees. The bevel was divided on its circumference into 25 parts, numbering every fifth graduation, beginning with zero.

A four-inch rod was threaded about half way to fit the nut and fastened in the other end of the sleeve with a bushing. The anvil was a piece of .25-inch rod fastened on the opposite frame opening, and allowed to project .5 inch inside the frame. Next the sleeve was run down until the screw came in contact with the anvil and a mark made on the stationary tube to register with the zero mark on the sleeve and at right angles to it. The sleeve was turned one revolution and another mark was made. This operation was continued until the caliper was opened to its fullest capacity. One complete turn equals 1-25 of 1-40 or 1-1000. Half and quarter-thousandths can be estimated readily.

CRITCHLEY EXPANDING REAMER.

Reamers are a valuable addition to the shop equipment as they are useful to enlarge holes to size. A complete set of these members in order to take care of different work means a large investment. The Critchley patent extending reamer, manufactured and marketed by Chadwick & Trefethen, Portsmouth, N. H., is designed to do the work of several instruments, inasmuch as the cutters are adjustable, permitting the reaming of odd sized holes, a feature which will be appreciated by the average workman.

The reamer is shown at Fig. 6 and it will be noted that a screw thread is cut on the body of the tool on either side of a space. The latter is left uncut to insure stability. Five grooves or slots are made in the shank to take the cutters which are beveled at each end and held securely by nuts. When in normal position a standard size is obtained. An enlargement is secured by loosening the retaining nuts and moving the cutters in the grooves, increasing the diameter of the cut.

Very fine measurements may be secured easily. The graduations vary by sixteenths, beginning at .46875 inch diameter, although in larger sizes the reamers vary from .125 to .25 inch. The device is not very expensive and extra cutters are obtainable for a small sum. The reamer is constructed of high grade material and all parts are strictly interchangeable.

AUXILIARY SEARCHLIGHT.

One of the most important accessories of the delivery type of commercial vehicle is a suitable light, one that will permit of reading house numbers where the streets are dimly illuminated. Considerable time is wasted by the driver in searching for the proper address and many times it requires the services of a pocket or oil light.

At Fig. 3 is shown the novel method of mounting an auxiliary acetylene lamp by a driver of an automobile whose duties carried him into the suburban districts where the street lights were poor. He purchased a five-inch swinging dash light and mounted it as depicted in the drawing. The supports were consructed of a piece of cold rolled steel, bent to the shape illustrated and made to take the pivotal arm of the lamp which was connected to the main line of the gas tank by tubing. Being fitted with a petcock the light could be shut off or used as desired. By it the operator was able to note the house numbers without leaving the seat.

HISEY ELECTRIC BREAST DRILL.

The up-to-date repair shop and many private garages have discarded the old-fashioned hand drill in favor of the tool operated by electricity. By it considerable time, as well as labor, is saved and the work performed more accurately as the workman can hold the instrument steadier than with the manually operated member. At Fig. 4 is presented one of three types manufactured by the Hisey-Wolf Machine Company, Cincinnati, O. The motor is operated by a direct current of 110 or 220 volts and the instrument is equipped

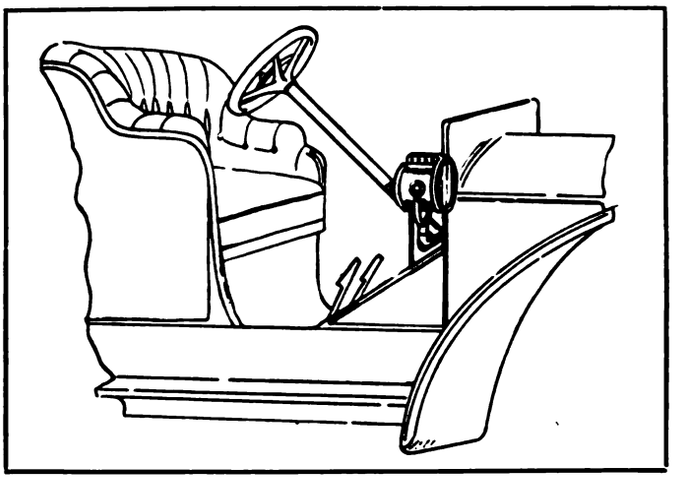


Fig. 2—Novel Method of Fitting Small Acetylene Swinging Lamp to Delivery Car.

with two side handles, one detachable and one combination end, and a breast handle. The speed of the motor varies according to the design, being from 400

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to 900 revolutions a minute. An offset chuck, permits of drilling in close corners.

The motor is completely enclosed, air-cooled, the openings being in the housing and protected by a brass screening, thereby preventing cuttings from getting into it, no matter in which position the drill is operated. The gears are cut from solid steel, hardened, run in grease, and are separately encased. The brush holders and wire connections are also enclosed, preventing short circuiting.

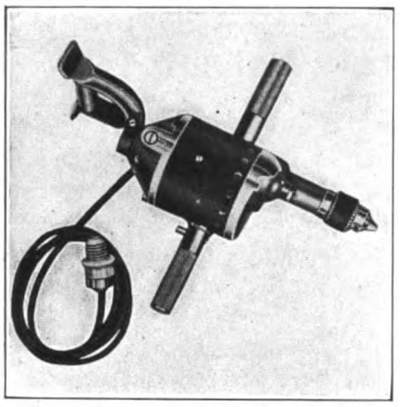


Fig. 4—Hisey Portable Electric Drill.

The operation of the drill is controlled by a patented, enclosed automatic switch which controls current by means of a brass trigger operated through the permanent handle. It is claimed that this construction prevents the operator burning his fingers or short circuiting the motor, and that the drill is under control at all times. The handles are of hollow steel tubing screwed into the housing, and each attachment plug has a fusible cap, protecting the motor from overload. The drop cord is connected on the outside of the motor housing which has an insulated cover, preventing any possible damage by lead wires and inside connections should it be accidentally torn loose.

SACHS MAGNALAMP.

An electric lighting device which will appeal to the repairman, machinist and the driver who takes care of his car, has been brought out by the Sachs Laboratoties, Inc., Hartford, Conn. It is similar to the ordinary electric lamp with the exception that it is equipped with a magnetic extension which carries a highly efficient electro-magnet combined with the lamp and connection socket, and a switch in a cylindrical structure.

The device will adhere to iron or steel surfaces, smooth, rough or uneven, painted or unpainted, and its grip is unaffected by heat or cold. A main switch is provided, this being only operative when the magnet attachment is not in use. It is operated by a knurled disc forming the central pole piece of the magnet, completing closing or opening the circuit with each snap. Pressing a push button on the side on the cylinder releases the grip of the magnet so that the lamp may be placed, removed or changed instantly. Releasing the button brings the magnet into service again. After the light has been turned on by the switch the current continues to flow irrespective of the manipulation of the magnet.

The Magnalamp requires a direct current and is furnished in two standard voltages, 110 and 220, for use with 16 candlepower carbon filament lamps. If utilized with lamps of less candlepower the magnetic grip is said to be less, due to the small amount of current, as the 110-volt member requires about .5 ampere and the 220 about .25 ampere. The device is made for service with higher candlepower and for use with other voltage than those designated. In addition to being of service when operating the lathe, drill press, miller, etc., it will prove of value when working on the motor car as it may be attached readily to any metal part of the chassis, facilitating the work. It is not expensive and for a small sum may be augmented by a counter balance device which permits the use of the lamp either with or without the magnetic member. At Fig. 5 is depicted one of the many methods of employing the Magnalamp.

CORRESPONDENCE

Cause and Effect of Auxiliary Air.

(7)—The company I am employed with has a converted pleasure vehicle, the motor of which skips when throttled down, but operates all right when speeded up. A friend of mine who is well up on automobiles says that the trouble is due to axuiliary air. Kindly explain how to locate where the air may affect the running of the engine. J. D. G.
Providence, R. I., July 15.

Considering first the effect of auxiliary air upon the operation of motor, it must be remembered that so many parts of air are mixed with one part of gasoline by the carburetor to produce the proper mixture. If the mixture is thinned by additional air drawn into the combustion chamber through leaks in the intake manifold or other components of the carburetion system the vapor is not ignited easily and the explosions are erratic. When the motor is speeded up the suction created by the piston is increased, there is a steady pull upon the carburetor and the mixture is not affected if the leaks be small. Being approximately correct in proportions the vapor ignites readily, producing an even running motor.

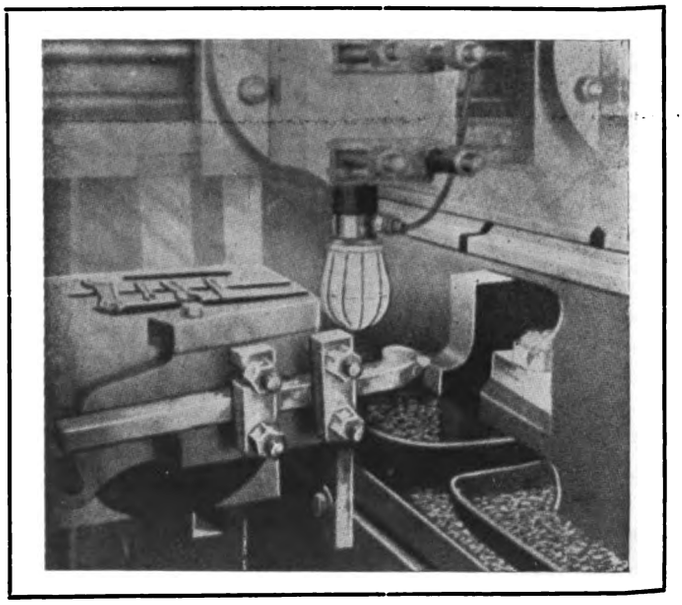


Fig. 5—Depicting Sachs Magnalamp, a Device Self-Adhering to Metal by Means of Electro-Magnet.

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There are numerous places where auxiliary air may find its way and among these may be mentioned the connections between the carburetor and intake pipe,

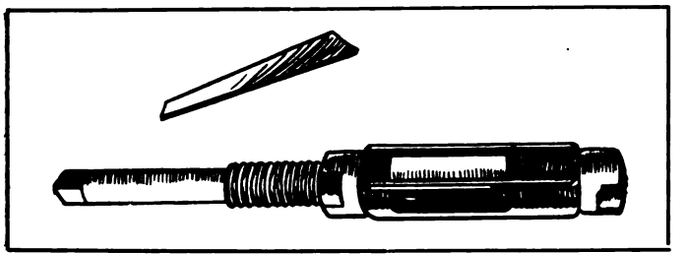


Fig. 6—Critchley Expanding Reamer, Fitted with Adjustable Cutters.

those of the manifold, valve caps, valve guides, etc. In an old motor the latter are most likely to be the cause of trouble and at Fig. 7 is depicted a worn member also outlining how auxiliary air finds its way between the guides and valve stem and thins the mixture. The gaskets and connections should be examined carefully, but in the case referred to it is probable that the trouble is caused by worn stems and guides. If worn they should be replaced with new bushings as it is impossible to adjust the carburetor so that it will produce a satisfactory mixture at both high and low speeds.

Clutch Drags.

(8)—Am experiencing considerable difficulty in changing speeds as the gears grind. In coming from high to second I have to slow the motor down to almost nothing else I cannot get the second in mesh. How can the trouble be remedied?
DRIVER.
Dallas, Tex., July 14.

The trouble may be caused by the clutch dragging, due to a worn bushing, or the intertia of the flywheel not being overcome; that is, the male member spins after the clutch is released making it difficult to change gears until the member on the main shaft rotates at a speed approximating that of the gear to be engaged. Examine clutch, withdrawing the member with the motor running and note if it continues to spin unduly. If it drags its bearings should be examined. Relative to overcoming the inertia of the flywheel, if it be the cause of difficult gear changing, it may be overcome by the fitting of a clutch stop, several designs of which and their method of installation were outlined in the June issue of MOTOR TRUCK.

High Speed Disc Broken.

(9)—I employ a small runabout for light delivery work which has given good service until recently. The transmission is of the planetary type and when the high gear lever is thrown in, the motor races and the car does not gain headway for some time. In climbing hills I have to go into the low when formerly the machine would climb easily on the high gear. Have taken up the adjusting mechanism to the limit but the slipping continues. What is the cause of the trouble, and how may it be fixed? INFORMATION.
Worcester, Mass., July 20.

The symptoms indicate a cracked high speed disc, which spreads and does not grip properly. The member is accessible and may be examined for cracks and if broken should be replaced with a new part. The transmission will have to be removed and disassembled to fit the new plate which will not be expensive. If not familiar with the operation it is best to have the work performed by a repairman.

New Versus Second Hand Car.

(10)—Am contemplating purchasing a small delivery machine for service in the laundry business for carrying work on long distance trips. Have been offered a second hand pleasure car at a reasonable price, but a motoring friend advises me to secure a new automobile. Would appreciate it very much if you will give me the benefit of your experience and advise me on the subject. LAUNDRYMAN.
New London, Conn., July 17.

Although there are many second hand pleasure cars which have been converted into commercial vehicles and these have given good service, the writer believes a new machine, one designed especially for the service referred to, would be more satisfactory in the end. The conditions under which a commercial car operates are different from those of the pleasure vehicle, among which may be mentioned starting and stopping, continuous service, etc. Manufacturers of the mechanical transport have taken into consideration the peculiar demands and have strengthened those parts subject to stresses. There are numerous light delivery cars adaptable to the laundry business which would be far more economical to maintain in the long run than a converted second hand pleasure car.

KNOX COMPANY GETS CONTRACT.

The Knox Automobile Company, Springfield, Mass., recently received the award of a contract to supply the city of Altoona, Penn., with a combination chemical engine and hose wagon.

PURCHASES MOTOR HORSE AMBULANCE.

The Louisiana State Society for the Prevention of Cruelty to Animals recently purchased from the General Motors Truck Company, Detroit, a specially designed horse ambulance which will be used in New Or-

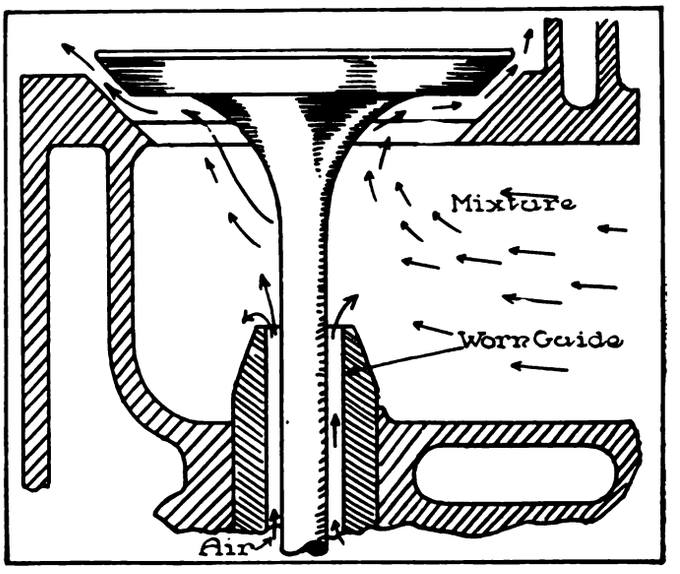


Fig. 7—Outlining How Worn Valve Stems and Guides Allow Auxiliary Air to Weaken the Mixture.

leans. The body is of special construction with side and end doors and a movable floor. It is mounted on a standard 2.5-ton G. M. C. chassis.

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FOREIGN TRUCK NOTES OF INTEREST

SAUTTER-HARLE MUNICIPAL WAGON.

Detailed Description of Interesting Combination Vehicle Now in Service Abroad.

In a recent issue of MOTOR TRUCK mention was made of a new type of garbage wagon in use in the city of Rouen, France. This is produced by Sautter-Harle et Cie, Paris, and since the successful demonstration in Rouen, the vehicle has become a standard product of this concern. Accompanying drawings bring out the details of construction.

The chassis does not depart greatly from the usual practise. The motor is a four-cylinder unit, having bore of 105 mm and stroke of 150 mm (4.13 by 5.9 inches), with the cylinders cast in pairs, and all valves on one side. The design is such that benzol is the fuel most generally employed, although gasoline may be utilized if preferred. The crankcase is of bronze. Lubrication is by force feed to all parts.

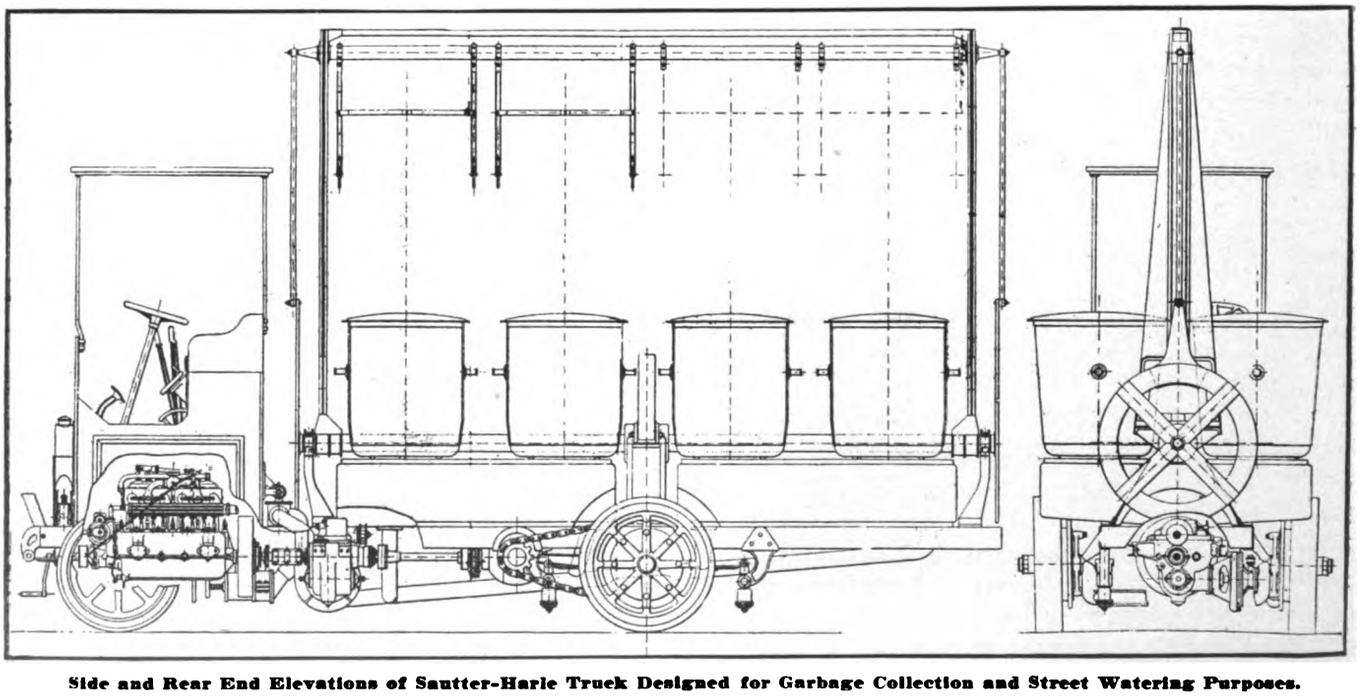
The entire mechanism, motor and transmission, is carried on a substantial sub-frame securely fastened to the transverse frame members. The transmission housing is of bronze and a universal joint is interposed between this and the clutch. The differential is carried in a separate cast steel housing in the countershaft. Final drive is by double side chains. A feature of the wheel equipment is the use of steel tires, which are said to have given excellent satisfaction on a number of vehicles in France.

As stated in a previous article, the body is designed primarily for the handling of garbage, which is collected from the individual house bins in large receptacles. The truck body is constructed to hold eight of these in two rows along the side, as shown in the side elevation herewith. The end elevation presents the mechanism for hoisting these bins into place on the wagon.

This consists of two steel columns, united by a fixed cross girder, and a moveable transverse member to which the bins are attached by chains. These obtain their movement from a set of gears within the transmission case, there being six different positions possible. All four bins on a side may be unloaded together, or each may be picked up separately. The truck may be loaded or unloaded from either side. It is understood that the services of but one man are required for this purpose.

In addition to this work, two shallow tanks, having a capacity of some 580 gallons, are located at the rear of the vehicle, these being a permanent fixture and the bins being located above them. It will be noted that the sprinkling devices are located at either side just behind the rear wheels. Provision also is made for pumping out flooded cellars, etc., the construction being such that the pump may be operated by the motor whether the truck be standing still or in motion.

By the use of these combination vehicles, the city is able to take care of the garbage collection problem during the early hours of the morning, and utilize the truck for street sprinkling and sweeping later in the day. The economy effected by this plan is obvious.



Side and Rear End Elevations of Sautter-Harle Truck Designed for Garbage Collection and Street Watering Purposes.

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Several French cities have been giving the matter serious study, and it seems decidedly probable that the influence of the Sautter-Harle will be felt in other countries in the near future.

NEW DE DION AMBULANCE.

Splendid Example of Neat Construction Providing Every Convenience.

The De Dion-Bouton Company of France recently delivered a new type of motor ambulance to the municipal hospital at Mulhausen, Alsace-Lorraine, Germany, which presents a decided advance in the construction of such vehicles on the Continent. Heretofore, American manufacturers have had little to fear from European producers in this respect. The latest car is in reality a two-bed hospital on wheels.

From the front or side, the vehicle cannot be told from a privately owned limousine, except for the word "Buergerspital" in gold letters upon the door panels. Two doors are provided at the rear, similar to those in use on an ordinary delivery van. Inside, there is accommodation for two wheeled stretchers, lying horizontally, one above the other, and supported by spring suspenders, which entirely do away with any unnecessary jar or shock. Both stretchers can be removed or placed back in position in a very short time, the upper one being lowered or raised by a crank driven chain and sprocket tackle. Seats are provided for a nurse and a doctor, and accommodations for restoratives, dressings, anæsthetics, and even surgical instruments for use in cases of extreme emergency.

The chassis is a four-cylinder, 25 horsepower model, and is fitted with pneumatic tires on the rear wheels. An idea of the completeness of the body and internal fittings may be realized when it is known that the price of the entire vehicle is £550 ($2676.58) more than the cost of the chassis without tires.

WHITE NEWSPAPER DELIVERY.

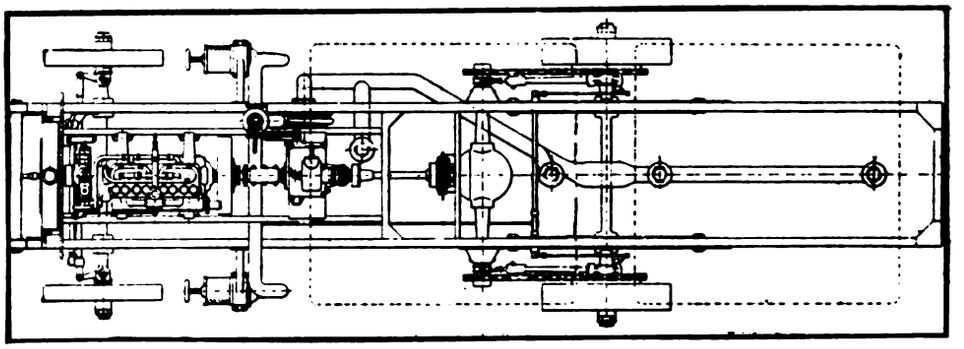
Teamsters' Strike Provides Demonstration That Means Permanent Installation.

The use of motor trucks in America has become so general, at least in respect to the numerous lines in which they have proved their practicability, that it is extremely difficult to cite instances in which the industrial transport has not been given a trial. Conditions are decidedly different abroad, and particularly is this true in England. It was not until the recent teamsters' strike in Great Britain, that many concerns had ever given serious consideration to the possibilities of the motor vehicle in commercial work.

An accompanying illustration shows a three-ton White truck, made by the White Company, Cleveland, O., in service with the London Daily News. Although the White Company has maintained a branch in London for a number of years and the White pleasure cars, both those propelled by steam and gasoline engines, have enjoyed a splendid popularity in all of the British dominions, it is somewhat surprising that the London Daily News had not been convinced of the advisability of utilizing a vehicle of this type instead of horses.

However, the strike tied up practically all horse transportation in England, and the News was left with a large supply of paper at the docks. Unless it could get this delivered at its offices, there was grave indication that the paper must suspend publication. Then it was that the utility of the White truck was brought home to the company in a forceful manner.

So satisfactorily did this car perform its task in this emergency, that the London Daily News decided to be entirely independent of horses in the future. The truck in question was purchased and has been in constant use since that time. Incidentally, the installation is expected to prove of decided value to the American motor truck industry throughout the British Isles.



Sketch Showing Plan View of the Sautter-Harle Combination Municipal Vehicle Chassis.

GENERAL NEWS FROM ABROAD.

For Solid Tire Standard Size—There is a strong feeling among the trade and the manufacturers of England that there should be a movement toward the standardization of solid tire sizes. Users have complained that they cannot make tests of various styles of tires as they would like, because of the varying sizes. It has been pointed out that rims can be turned down to fit, but there is objection to this process on the part of some for fear the rim would not prove so durable. It is expected that a move will be made soon toward the realization of standard sizes.

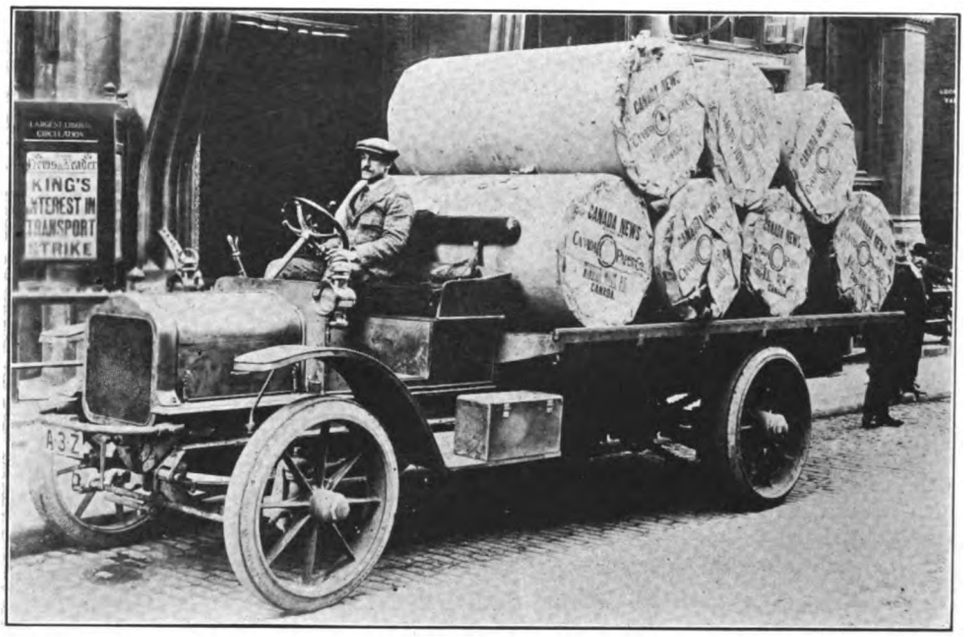
Fire Engine in Lausanne—The municipality of Lausanne, Switzerland, with about half the population of Geneva, has requested $5983 from the city legislative body for the purchase of an automobile fire engine. Such engines are already in use in other Swiss cities, Basel, Berne and St. Gall. The pumps are worked by the engine motor, and have a flow of 800 to

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1300 liters (214 to 344 gallons) of water a minute.

Opening in Latin-America—A business man in a Latin-American country has expressed to an American consul his intention to establish a dray line of motor trucks in the city in which he is located, as soon as the streets are rebuilt, which will take place in the near future. He would like to hear from American truck makers regarding their products, and would be glad to receive catalogues in Spanish, and other particulars that would be of value. The address can be secured at the Bureau of Manufactures, Washington, D. C. Still another foreign trade opening for American manufacturers is reported by a consul in Australasia. The manager of a motor car company there has told the United States representative that he would like to secure a line of American made electric motor trucks.

Passenger Service in Brazil—That greater facilities for handling freight and passengers between inland cities in Brazil may be provided, the government recently passed a law relative to the upkeep and repair of the roads. This law provides for the granting of concessions securing to the concessionaries, during a period of 30 years, the sole right of carrying goods and passengers by means of motor vehicles over existing state roads, upon condition that the concessionnaires rebuild the roads, and maintain them in a condition suitable for motor and wheeled traffic during the time of the concession.



Three-Ton White Truck in Service with the London Daily News for Hauling Paper Stock.

Want Fire Apparatus—The town council of Edinburgh, Scotland, has decided to purchase three motor fire engines and two motor tenders. Estimates for the cost of this equipment are being received, the plans and works committee having charge of the bids. The corporation of Bury, Lancashire, England, is also to purchase fire fighting apparatus, and has asked for tenders for the supply of a motor tower wagon. The general manager, Central Tramway offices, Bury, will provide prospective bidders with necessary information regarding requirements.

For Good Roads in Cuba—The Association de Buenos Caminos, a good roads organization, was recently formed in Cuba. The membership is composed largely of automobile owners, and its object is to increase the mileage of good roads and to prepare and publish maps of those now available on the island.

Show in Sydney—One of the features of the automobile show in Sydney, N. S. W., a short time ago, was the exhibit of motor trucks, tractors and business wagons. Practically all of the leading English manufacturers of commercial cars and tractors and motor wagons suitable for use in farm work were among the exhibitors. An American exhibit was that of the Avery tractor, made by the Avery Company, Peoria, Ill., and exhibited by the Canada Cycle & Motor Company, Ltd., of Sydney. Plans are under way for another exhibit of similar character in September at which Americans are urged to make display.

Taxicab Company in Melbourne—The Globe Motor & Taxi Company, Ltd., was recently formed in Melbourne with a capital of £50,000 ($243,325). The company proposes to establish motor 'bus passenger services where paying traffic can reasonably be assured, the hiring of taxicabs and other passenger vehicles, and the hiring of commercial and industrial trucks. The company also intends to acquire Carey's taxicab and motor hiring business, and the cars, plant and machinery of the late D. M. A. Field, as well as several agencies. The directors are: Sir Henry Weedon, K. B.; Sir Alexander Peacock, K. C. M. G.; Alderman Edward G. Gurr and Ralph Archbold. A. V. Renowden is to be the general manager.

Truck Line in Venezuela—A 30-year exclusive contract has been signed between the Venezuelan government and Norberto Borges, which provides, upon congressional approval, for automobile service over an extended territory—from Valencia, passing through Tocuyito, Tinaquillo, Tinaco, San Carlos, Acarigua, Ospino and Guanare, to Barinas, with a branch from Acarigua to Barquisimeto. The enterprise may establish auxiliaries in the states of Cojedes, Portuguesa and Zamora, after securing government consent. The first section of the line must be in operation within a

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year, and the entire system within three years. It is stated that the country through which it is proposed to run the line is rich and productive, and that sufficient traffic can be found to make the venture profitable.

Ambulance for Johannesburg—The Anglo-French Garage Company at Johannesburg, Cape Colony, recently secured a contract through the town council to supply the city with a motor ambulance. The chassis will be manufaceured by the Leyland Motors, Ltd., Leyland, Lancashire, England, and the body will be constructed in Johannesburg. Steps are to be taken, it is said, by prominent business men in Johannesburg to form a company for the maintenance and operation of a service of motor omnibuses, with possibly a regular service to Pretoria. The matter is only in an embryo state at present.

Trials for Reapers—The Automobile Club de France recently held a demonstration for motor driven reapers and binders at the national agricultural school at Grignon. The classes provided for were reapers, or reapers and binders, having all or a part of their apparatus driven by an internal combustion motor. The trials were based on the useful work accomplished, the fuel, oil and water consumption, and the net cost. No rewards of merit were given, but all firms entering received certificates of the results obtained.

Big Business at Elstow—Saunders & Gifkin, Elstow, Bedford, England, recently erected additions to its plant, included in which was a foundry and smith's shop. The business that this firm is doing in the manufacture of motor trucks for farm use furnishes a good illustration of the increased interest that is being taken in various parts of the world in the utilization of the motor vehicle for work in agricultural districts. The firm is now constructing machines to be sent to South America, New Zealand, Nyassaland, Russia and Italy.

Regulations in Montreal—Montreal, Can., proposes the adoption of bylaws for the regulation of public passenger carrying motor vehicles in that city, which among other things require that a seat shall be provided for every person carried. The carrying capacity of each vehicle is to be determined by an official of the city and the limit shall not be violated. Between the hours of 8 and 10 in the morning and 5 and 7 at night, companies operating motor 'bus services must provide machines every five minutes on authorized routes. The fare charged must not exceed five cents, and transfers good at terminal points must be provided on application. The speed limit will be nine miles an hour, and four in crossing streets or turning corners. The conductors shall be required to speak both English and French, and must call the places of stoppage in both languages.

Exhibit Tractors in Austria—One of the principal features in connection with the Bohemian Annual Agricultural Exhibition, held recently at the Prague exhibition grounds, Austria, was the increased display of traction engines and machinery made in Germany. The number using gasoline as a motive power was double that exhibited in 1911.

Motor Fire Engine for Windsor—The Windsor, Ont., fire department will be equipped with an automobile fire engine this year if a recommendation of the fire committee is approved. According to present plans a vote of the rate payers will be required before the purchase can be made. A similar proposal was submitted last year and voted down, but the members of the city council and water commissioners are agreed now on the necessity for the new apparatus and it is believed a favorable vote of the people can be secured.

Consul Announces Opening—An American consul in a foreign country has submitted a complete statement concerning the demonstration trial of motor trucks to be held in his district during September, the exact date of which has not been determined. As a result of these tests it is expected that 30 to 40 cars will be purchased by the government for use in certain branches of the service. He states that American cars seem to be looked upon with favor, and that their merits are frequently commented on by officials in the country in question. A copy of the complete report, containing the conditions governing the trial, can be secured by applying to the Bureau of Manufactures, Washington, D. C.

CROSS COUNTRY DELIVERY SYSTEM.

A motor vehicle service has been established between the towns of Sharon and Mercer, Penn., by the Sharon-Mercer Auto Transit Company. One 12-passenger touring car was put in commission and another has been ordered for immediate delivery. Later, if the service requires it, other automobiles will be bought. The distance between the two towns is approximately 14 miles, and the first machine to arrive has been making three trips daily each way. Better accommodations will be provided as soon as the second car arrives.

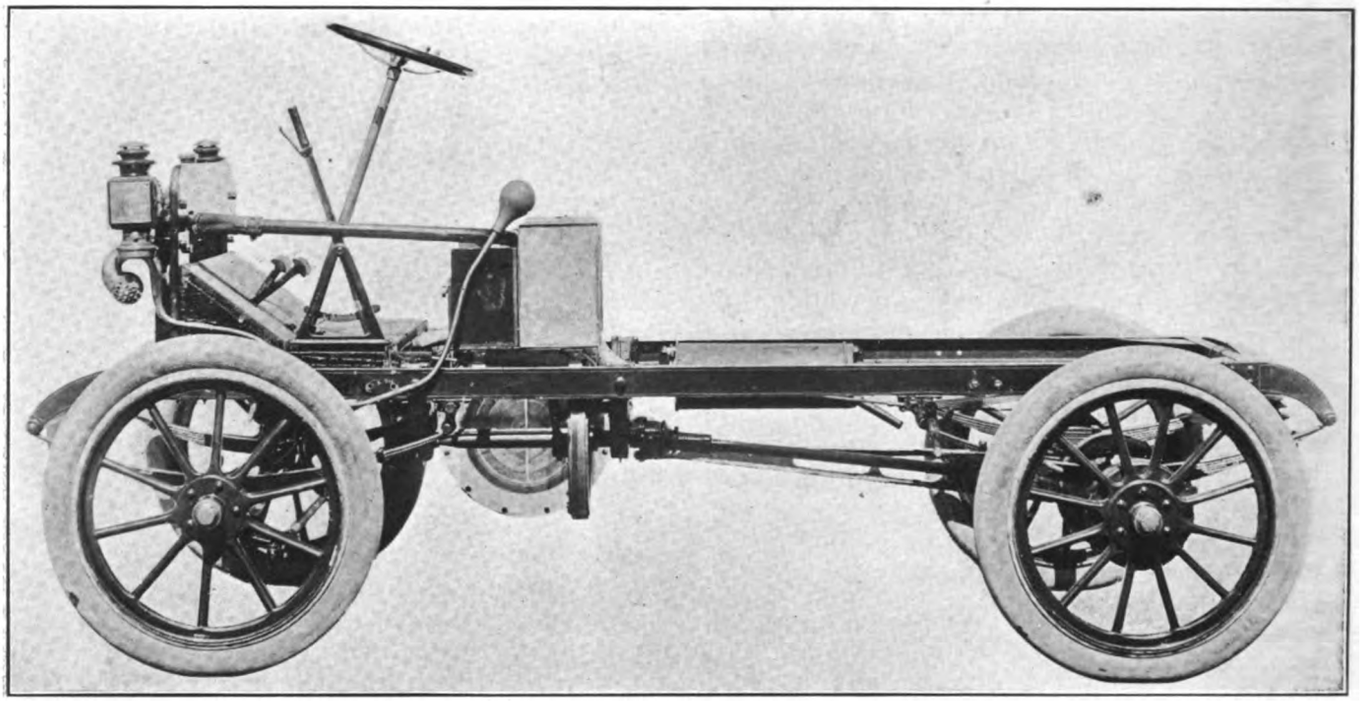
INSTALLS TIRE CHANGING OUTFIT.

Under the direction of C. W. Martin, Jr., manager of the motor truck tire department of the Goodyear Tire & Rubber Company, Akron, O., a new hydraulic press and tire applying machine for motor trucks was recently installed at the Philadelphia branch of the concern. The new equipment is said to be the best of its kind in the country, and according to Mr. Martin, motor truck tires can now be changed in a quarter of the time that was required before the machine was installed. The new machinery includes a 75-ton hydraulic press, hooping plate, small drill press, band saw, radial drill and other up-to-date devices.

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WOLVERINE-DETROIT EMPLOYS FRICTION DRIVE.

A NEW commercial vehicle of the light delivery type, having a capacity of 800 pounds, is the Wolverine-Detroit which has just been placed in the market by the Pratt, Carter, Sigsbee Company, Detroit. The design is notable for compactness and throughout the best grade of material and workmanship have been incorporated, which with several novel constructional features will appeal to those seeking a light machine capable of efficient service at a low cost of maintenance. The power plant has many commendable features and is located under the driver's seat at the right with left hand control. Simplicity of operation is made possible by one lever, that controlling the friction drive, which is at the left of the motor and which supplies an indefinite number of speed ratios.



Chassis of the Wolverine-Detroit Light Delivery Vehicle Which Is Fitted with Friction Drive and Many Novel Constructional Features.

The power plant is very compact and is close to the right side frame, its suspension making for a low centre of gravity. The motor is of the four-cycle, water-cooled type, the single vertical cylinder having a bore of 4.5 inches and a stroke of 5.5. It is pointed out by the designer that it develops ample power for the weight and carrying capacity of the machine when fully loaded. The cylinder proper presents a square shaped appearance with the intake and exhaust valves located on the right, these being of the cone poppet type, 2.25 inches in diameter, making for easy passage of the mixture and burned gases. The valve mechanism is fully protected from dust or dirt by an oil tight cover of liberal dimensions and is retained by six bolts. The cover and cylinder are machined, insuring an accurate fit and making possible operation of the valve stems and springs in an oil bath, reducing wear to a minimum.

The valve caps are ample in size and are fitted with a hexagonal head. The intake member is tapped and drilled to take a priming cup, a desirable feature in cold weather. Particular attention has been paid to the matter of cooling and both the water jacket and pipes circulating the fluid are extremely liberal.

Cooling.

Circulation is by the thermo-syphon system, cold water entering the water jacket at its lowest place, passing around the exhaust valve and surrounding compartments and flowing out through the top of the motor at the left and thence to the radiator. Both inlet and exhaust water manifolds are liberal in size, being retained by a stud and lock nut, an arrangement permitting of cleansing of the water jacket when desired. The large vertical tube radiator is located in the dash, protection being provided in front by a bumper bar while the rear is covered by the floorboard. Special attention has been paid to the suspension of the radiator it being such that removal is an easy matter and road shocks are eliminated.

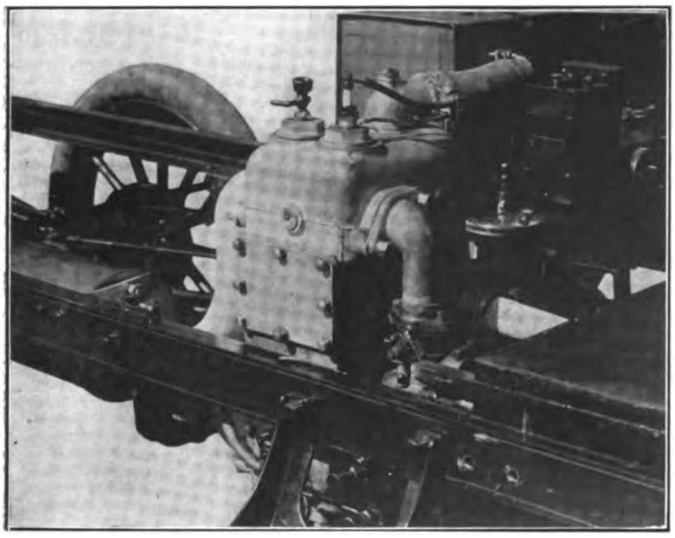
The crankshaft is of a high grade steel, carefully ground, and extra large babbitt lined bearings are employed. The connecting rod is also of high grade material with large babbitt bearings and access to these as well as other components of the motor is made possible by the removal of a large inspection plate.

The intake pipe is located in front of the motor as is the carburetor and the latter is a float feed, automatic type having but one adjustment, that of the fuel. The exhaust pipe is at the rear of the cylinder, ample in size and its curve is gradual to the muffler which is in a straight line, an installation reducing back pres-

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sure, created by the exhaust, to a minimum.

The motor is suspended on a sub-frame, the rear member carrying the actuating mechanism of the driv-



Right Side of Wolverine-Detroit Power Plant Outlining Method of Suspension Under Driver's Seat.

en disc and being very substantial. Although securely anchored to the main frame it may be removed readily if desired. Two large extensions of the motor casting are bolted to the sub-frame, which is carried well below the main member, a construction making for easy access to and the removal of the lower crankcase. This carries the main shaft bearings, which may be adjusted easily without disturbing the crankcase. An extension of the crankshaft at the right of motor provides for attachment of the starting crank.

Ignition.

Ignition is by jump spark with a high-tension coil and multiple dry cells. The latter are located just forward of the fuel tank in a position convenient to the operator and the control switch is at the right of the driver. A feature of the wiring system is its simplicity, and the removal of the driver's cab or body does not require disconnecting any of the leads. It is pointed out by the maker that the dry cells being wired in multiple and the motor a single-cylinder, these members will supply proper current for thousands of miles without replacement.

Lubrication.

A constant level splash system of lubrication is employed, the dipping of the crankpin and connecting rod splashing and carrying lubricant to the cylinder walls, piston, etc. Provision also is made for an additional lubricator of the gravity feed type and this member is very accessible and easily operated.

The timing of the spark in the combustion chamber is obtained by a circuit breaking device mounted just above the extension of the crankshaft. A finger like cam attached to an extension of the camshaft actuates a trembler blade, making and breaking contact, completing and interrupting the primary circuit. The trembler blade is mounted in a movable housing attached to which is a rod connecting with the spark control lever on the steering wheel, and advance and retard of the spark is obtained in the usual manner.

The usual tank is constructed of heavy material, of large capacity and is mounted over the flywheel of the motor being retained by straps bolted to the main and sub-frame.

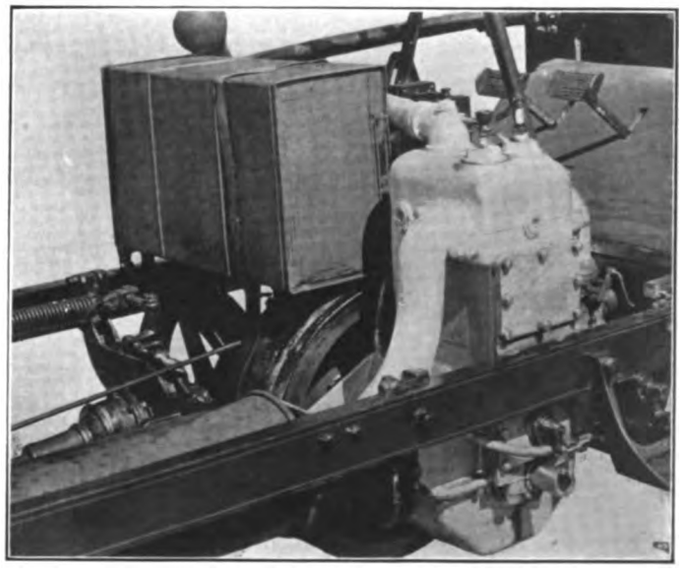
Friction Drive.

As a friction drive is employed the usual clutch and transmission gears are eliminated, reducing weight. By it any number of speed ratios are obtainable in either a forward or reverse position, these ranging from a very few miles an hour to the maximum output of the power plant. The face of the flywheel is provided with a friction disc as is the periphery of driven disc and it is claimed by the maker that the machine may be operated fully loaded through deep sand or on heavy roads without either member slipping.

The flywheel is fitted with a large high grade ball thrust bearing while the driven disc is mounted on a liberal sized shaft operating in two annular bearings. This shaft is connected directly to the pinion shaft through a double Spicer universal joint assembly, one of these members being located directly back of the the sub-frame carrying the driven disc actuating mechanism while the second is fitted in front of an extension of the differential housing to which is attached the torsion rod. The latter is of pressed steel, webbed, and is carried slightly outward and secured to a bracket device attached to the sub-frame.

Axles and Springs.

The rear axle is of the fixed hub type and large Timken roller bearings are utilized throughout. The driving shafts are of a high grade nickel steel and the pinion and crown gears are of the same material, carefully cut and accurately meshed. Semi-elliptic springs 40 inches long and 1.75 wide of carefully tem-



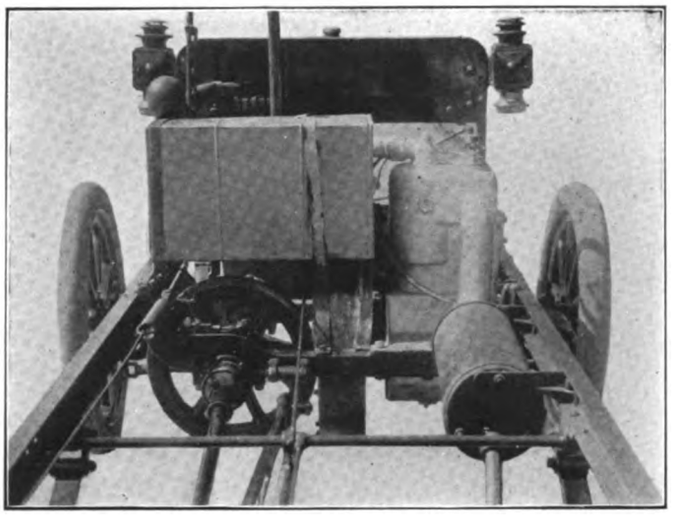
Depicting Rear View of Motor and Novel Method of Locating Steering Column Between Operating Pedals.

pered high grade steel are fitted both front and rear, the latter being secured to the axle housing by liberal sized spring clips.

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The front axle is a Timken I beam section type equipped with roller bearings and the knuckles and spindles are of ample size. The tierod is located behind the rear axle, protecting it from road obstructions and is of the adjustable type. The reachrod operates transversely, it being pointed out by the maker that its arrangement makes for easy steering. The steering gear and operating pedals are carried on the subframe at the left and a feature of the steering column is its location between the clutch and brake pedal. The lever controlling the operation of the driven disc is also at the left. Steer is by the usual hand wheel.

The brakes are of the internal expanding type located on the rear wheel. They have liberal friction surface and even contact is secured through an equalizing rod. The frame is of channel steel construction with corners securely braced by gusset plates and all connections are riveted. Access to the driver's seat at the right is by means of a metal step secured to the frame, thus eliminating the running board.



The Friction Driven Disc Is Located at the Left of the Motor and the Driving Shaft Provided with Double Universal Joints.

The wheels are of the artillery type, of carefully selected wood. The front members have 10 spokes and the rear 12, these being 1.375 inches. The standard tire equipment is 32 by 3.5-inch pneumatic, or 34 by 2.5-inch solid clincher. Quick detachable rims are fitted as standard with the pneumatic tire equipment. The choice of tires is optional.

The standard body size is 40 by 64 inches although special bodies are constructed to meet the requirements of the purchaser. The open express body lists slightly less than the top body, and both members are highly finished. The driver's seat is upholstered with a high grade leather, and the cab is integral with the body. The usual standard equipment of lamps, horns, tools, etc., is furnished.

WILL FEATURE MOTOR TRUCKS.

With an idea of featuring the motor truck, the Fillow Auto Company of Danbury, Conn., a short time ago purchased two lots of land immediately east of the company's garage on Crosby street, that city, and will commence at once the erection of a large addition to its plant. The new plot has a frontage of 75 feet and a depth of 150 feet. The property at present occupied by the company's buildings is 50 by 100 feet, so that the addition will practically triple the space utilized by the concern.

G. M. C.'S IN SAN FRANCISCO.

The total number of users of G. M. C. trucks in San Francisco is 133, which is quite a tribute to the product of the General Motors Truck Company, Detroit. The largest number owned by one firm is eight, the next five, with several owning two or three. The lines of business in which these are used are greatly diversified.

VELIE WINS HILL CLIMB.

A Velie light delivery wagon, made by the Velie Motor Vehicle Company, Moline, Ill., was first in the delivery class in the Bangor, Me., hill climb, recently held, and was only defeated by one car in the free-for-all. The truck was supplied by A. J. Shorey, agent for the Velie product in Bangor. The car was not stripped, like a number of other competitors, but went into the contest with the regular equipment, including delivery body.

SPEEDWELL SAVES MONEY.

An exceptional reduction in the cost of hauling copper ore in the mines of the Calaveras Copper Mining Company of Copperopolis, Cal., has been made by the introduction of motor trucks. L. V. Lynch and R. Harry Croninger of the Speedwell Motor Car Company, Dayton, O., recently succeeded in inducing the officials of the mining company to purchase four six-ton Speedwell trucks. The result is that comparative figures, kept since the motor vehicles were placed in commission, show the ore is hauled from the mines at a cost of 80 cents a ton as against a cost of $3.50 when horses were used.

KISSELKAR PULLS TWENTY TONS.

A KisselKar three-ton truck, made by the Kissel Motor Car Company, Hartford, Wis., performed a remarkable feat in Kansas City, Mo., the other day when it moved a 37,000-pound boiler, placed on an old-fashioned wooden wheeled truck weighing 6500 pounds, a distance of 1.25 miles in 40 minutes up a three per cent. grade. Twelve horses had been assigned to the job, and it was estimated that the moving would require at least 10 hours. The up-grade part of the route was over asphalt and the weight of the trailer and boiler was so great that the wheels sunk at times as much as two inches into the pavement. The KisselKar carried no ballast, and performed its task with apparently no trouble.

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NEWS OF THE COMMERCIAL VEHICLE INDUSTRY.

Recently Organized Stewart Concern Announces Its Line---Gramm Reveals Future Plans---Willys Adds Another Plant---Several New Trucks Coming.

The plant recently vacated by the Niagara Machine & Tool Works at the corner of Randall and Superior streets, Buffalo, N. Y., has been secured by the Stewart Motor Corporation, recently formed by T. R. Lippard and R. G. Stewart, who on June 1, withdrew from the Lippard-Stewart Motor Car Company of Buffalo. Orders for machinery, equipment, etc., are being placed and the building will be put in condition for occupancy as rapidly as possible. Manufacture will be started as soon as convenient, so as to fill orders already received for early fall delivery.

Light trucks will be made by the new company, to be known as the Stewart, named after the designer, Mr. Stewart. Automobile men who have seen the new models proclaim them as far ahead of anything of the kind on the market, and say the new cars are bound to meet a ready sale.

Mr. Lippard is president and general manager of the new company and Mr. Stewart is vice president and chief engineer. R. P. Lentz, for several years connected with the London & Lancashire Fire Insurance Company, Hartford, Conn., is secretary and treasurer, while Robert W. Ingersoll, recent branch manager of the Firestone Tire & Rubber Company in Buffalo, will be sales manager.

GRAMM REVEALS PLANS.

Joins With Bernstein and Others from Old Concern in the Production of New Models.

B. A. Gramm, who retired from the Gramm Motor Truck Company a short time ago, when the controlling stock in that concern was acquired by President John N. Willys of the Willys-Overland Company, Toledo, O., has formed a partnership with M. Bernstein, formerly a director in the Gramm company. The new concern will be known as the Gramm-Bernstein Company, and it will devote its energies to the exclusive manufacture of trucks.

A very close corporation has been formed with a capital stock of $500,000, of which $300,000 is common and $200,000 preferred. Mr. Gramm is vice president and general manager; Mr. Bernstein is president and H. O. Bentley, secretary. Fred Biszantz, one of the best known men in his line in the country, formerly designer and factory superintendent with the Gramm company, will occupy the same position with the new concern.

A large plant has been purchased, to which additions are being constructed. When these are finished the factory building will provide 125,000 square feet of floor space. All the structures are equipped with the most modern lighting system, are well ventilated, and particular attention has been paid to their sanitary appointment. They are located on the main line of the Pennsylvania and D. T. & I. tracks, the best of facilities for shipping being provided.

Members of the corporation have been working on the business for considerable time, and it is their intention of placing on the market a truck, which is as near perfection as possible. They anticipate that specialization in truck making for many years has fitted them to place the best of products before the public. Already the company has orders for half of its next year's output. It is the aim to produce commercial vehicles that will themselves prove the company's best salesmen.

BRENNAN TRUCK INTRODUCED.

Three Models to Be Produced by Syracuse Concern Heretofore Prominent as Motor Manufacturer.

The Brennan Manufacturing Company, Syracuse, N. Y., for a number of years maker of gasoline engines, has placed a truck on the market, and in the future will devote a part of its plant to the manufacture of commercial cars. Three models are to be produced —one of two tons capacity, equipped with a 35 horsepower Brennan four-cylinder motor; one of three tons capacity and 38 horsepower, and a third, a five-ton vehicle, using a 45 horsepower engine.

The machines will employ progressive transmission, thermo-syphon water cooling, Bosch dual ignition, cone clutch and semi-elliptic springs, with auxiliary cross springs to carry the overload. Robert J. Rothwell, formerly in the truck department of the H. H. Franklin Company, Syracuse, N. Y., will be in charge.

JEFFERY MODEL READY.

Well Known Maker of Rambler Pleasure Line Is Prepared to Enter Commercial Field.

Although the Thos. B. Jeffery Company, Kenosha, Wis., well known maker of the Rambler pleasure line, displayed a 1.5-ton truck at the Chicago show in February, little has been heard concerning this product since that time. Exhaustive tests have been under way, however, and the company is now ready to place the vehicle on the market. It will be known as the Jeffery.

The motor is located under the seat and footboards, and is rated at 38 horsepower. It is of the vertical, four-cylinder, water-cooled type. A Bosch high-tension magneto is utilized and lubrication is by a com-

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bination force feed and splash. The transmission provides three speeds forward and reverse. Final drive is by side chains. The steering wheel is on the left hand side.

The frame work is of pressed steel, the total length being 185 inches, with 120 inches back of the driver's seat. The stock body is 60 inches wide and the same length of the frame back of the seat, and is of the platform style. The wheelbase is 120 inches. All springs are semi-elliptic.

Two sets of brakes are employed, the service brake being operated by the pedal, and the emergency is with a hand control. The service brake drums are on the countershaft and the emergency drums are on the rear wheels. Front and rear wheels are 34 inches in diameter, the front being shod with four-inch solid tires and the rear with three-inch solid dual. The gasoline tank is located under the seat, having a capacity for 20 gallons. The lubricating oil supply is one gallon.

THE NEW YORK SHOW.

Automobile Board of Trade Lays Plans for Next Year's Exhibition in Two Buildings.

Arrangements for the annual commercial vehicle show in New York City, to be separate from the exhibition of pleasure cars, were considered at a recent meeting of the Automobile Board of Trade. The display will be held in two buildings—the new Grand Central Palace and the Madison Square Garden, although but one admission will be charged. The dates are Jan. 20-25, immediately following those for pleasure cars in the same buildings Jan. 11-18. Resolutions were passed on the death of Alfred N. Mayo of the Knox Automobile Company, one of the oldest members of the board, and a leader in the automobile industry since its inception.

Those present were: M. L. Downs, Autocar Company; W. C. Leland, Buick Motor Company, Cadillac Motor Car Company, Cartercar Company, Elmore Manufacturing Company, Marquette Company, Oakland Motor Car Company, Olds Motor Works, Rapid Motor Vehicle Company, Reliance Motor Truck Company; Hugh Chalmers, Chalmers Motor Company; James C. Dryer, James Cunningham, Son & Co.; G. H. Stilwell, H. H. Franklin Manufacturing Company; G. W. Bennett, Garford Company; E. W. Headington, Haynes Automobile Company; E. H. Broadwell, Hudson Motor Car Company; Howard M. Davis, Knox Automobile Company; William T. White, Mercer Automobile Company; William E. Metzger, Metzger Motor Car Company; James M. Cram, Mitchell-Lewis Motor Company; W. H. VanDervoort, Moline Automobile Company; E. J. Moon, Moon Motor Car Company; George M. Dickson, National Motor Vehicle Company; C. C. Hanch, Nordyke & Marmon Company, Premier Motor Manufacturing Company; M. J. Budlong, Packard Motor Car Company; L. H. Kittredge, Peerless Motor Car Company; Charles Clifton, Pierce-Arrow Motor Car Company; George Pope, Pope Manufacturing Company; Oscar Stevenson, Pullman Motor Car Company; F. B. Stearns, F. B. Stearns Company; J. E. Quimby, E. R. Thomas Motor Car Company; Windsor T. White, the White Company; Alfred Reeves, United States Motor Company; John N. Willys, Willys-Overland Company; C. W. Churchill, Winton Motor Carriage Company; H. A. Bonnell, general manager.

SECURES NEW BUILDING.

Buffalo Electric Concern Laying Plans for Construction of Commercial Cars and Baggage Trucks.

The recently organized Buffalo Electric Vehicle Company, Buffalo, N. Y., has closed a deal whereby it secures control of the entire building at Main and Barker street, formerly occupied by the Denniston Company, and used by it for the construction of automobile bodies. The new structure is desirable for manufacturing and display purposes and is up-to-date in every respect.

According to present plans the plant formerly occupied by the Babcock company will be used for the manufacture of electric commercial vehicles and electrically driven baggage trucks, while pleasure cars will be manufactured on the upper floor of the newly acquired building. On the main floor of the latter building a large retail salesroom will be conducted, where will be displayed the various models of pleasure and commercial cars. Under the new arrangement the Buffalo Electric Vehicle Company has the most imposing salesroom in the city, and one of the finest in that section of the country.

WILLYS BUYS OUT GARFORD.

Elyria Plant Added to the Holdings of Interests Controlling Overland and Gramm Factories.

President John N. Willys of the Willys-Overland Company, Toledo, O., recently secured control of the Garford Company, Elyria, O., maker of the Garford truck. For some time previous to the transaction the Willys-Overland Company had an agreement with the Garford Company whereby it had general supervision of marketing of the Garford product. Now the Willys interests will also have charge of the manufacture.

Mr. Willys has been elected president and George W. Bennett vice president, these being the same positions they occupy in the parent Willys holding company. Mr. Bennett plans to spend a day each week at the Garford plant, as well as a day a week at the plant of the Gramm Motor Truck Company, Lima, O., also recently secured by Willys interests. Mr. Garford sailed for Europe following the disposal of his interests, accompanied by M. D. Johnson of Cleveland, O., his attorney and business adviser.

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WILL BE REORGANIZED.

New Albany Venture to Be Resumed with New Capital Invested in Motor Truck Construction.

A reorganization of the American Automobile Manufacturing Corporation in New Albany, Ky., with Ferdinand Kahler of New Albany as president and general manager, will follow the approval of the sale of the plant of the American Automobile Manufacturing Company, which passed through a receivership that terminated recently in its sale for $45,000, it is said. Mr. Kahler and O. E. South of Cincinnati have acquired 55 per cent. of the stock of the new company and they have joined interests.

Mr. Kahler is president and general manager of the Kahler Company, general wood worker in New Albany, which for several years has made a specialty of the manufacture of automobile beds. It is stated that the new company will devote practically all its attention to the manufacture of motor trucks.

ADDITIONAL ITEMS OF INTEREST.

Martin Tractor Incorporators—The Martin Tractor Company has been formed in Indianapolis, Ind., and has been incorporated under the laws of the state for $350,000. C. H. Martin is the head of the new concern and the other directors are Hugh R. Richards, F. B. Davenport, Edward D. Moon and George D. Thornton. It is the intention of the new company to produce the Martin three-wheeled tractor, which is now manufactured under a shop license by the Knox Automobile Company, Springfield, Mass.

Nyberg Trucks on Large Scale—The Nyberg Automobile Works, Anderson, Ind., recently made the announcement that in the future it would manufacture trucks on a large scale, these being of 3000 pounds capacity. One, loaded to its full capacity, was in the Indiana Four States tour, the test being one of the most severe to which a gasoline truck was ever subjected.

Siebert Factory Enlarged—Work is progressing rapidly on the construction of the new three-story factory building being erected in Toledo, O., by the Shop of Siebert. The structure, when completed, will be 75 by 125 feet, and it is expected will provide plenty of floor space for this part of the company's business for some time to come. It will be of steel and reinforced cement construction. The Shop of Siebert was organized in 1853 to build carriages and wagons. When the automobile came into prominence the concern gradually worked into this line and has been exceptionally successful in making and marketing the Siebert truck.

Heads Morgan Company—Charles B. Foster, for the past 10 years president of the Foster & Richardson Bedstead Company of Westboro, Mass., recently withdrew from that firm to become president of the Morgan Motor Truck Company in Worcester. Up to about eight months ago, Harry Unwin of New York was president, but at that time he returned to his old position. Since then the position has been held by Charles H. Derby of Worcester, a lawyer, pending the time when the right party could be secured for taking the position permanently.

To Make Russell Trucks—The Russell Motor Car Company, West Toronto, Can., is contemplating the manufacture of a complete line of light delivery wagons and heavy trucks, it is claimed. The company a short time ago announced an increase in capital stock, and the bond issue was almost at once over-subscribed by Toronto capitalists. A new plant is in course of construction which will be used exclusively, it is believed, for the manufacture of commercial motor vehicles. Plans of the company are expected to be forthcoming within a short time.

Produces Lumber Vehicle—A new truck, designed for the exclusive hauling of lumber, has been placed on the market by the Henry Lee Power Company of Chicago, maker of the Old Reliable line of commercial vehicles. The new model has a standard stake body, 15.5 feet long and six feet wide, of the removable type, two extra bodies also being furnished when desired. Rollers in the platform of the body make the changing of the bodies when loaded comparatively easy, and also prove a great aid in dumping loads. Racks are also furnished on each side of the body, capable of holding lumber 24 feet in length. The wheelbase is 144 inches.

Brown Organizes Company—Will H. Brown, with a number of business associates, has formed the Brown Commercial Car Company in Peru, Ind. It is the intention of the new concern to manufacture and place on the market a light delivery wagon. Mr. Brown is the president of the concern and Carl H. Wallerich is the vice president, the latter resigning as manager of the General Industrial & Manufacturing Company of Indianapolis to join the Brown forces. The former is president and general manager of the Mais Motor Car Company of Indianapolis, in which capacity he will remain in addition to devoting considerable time to the new concern. The plant formerly occupied by the Otis Elevator Company has been secured.

New Factory in Pittsburg—The Pitt Motor Truck Company was recently organized in Pittsburg, Penn. The capital stock of the concern is $200,000, which is being subscribed readily. Members of the firm are J. E. Douglas, E. P. Douglas, W. S. Phillips, F. R. Brandt and J. McCalmont. It is the intention of the concern to manufacture commercial cars exclusively, and it is hoped that a factory may be started sufficiently early to place the first product on the market by fall.

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WINNIPEG AGRICULTURAL TRIALS.

American made machines carried off the honors in the fifth annual contest of agricultural motors, tractors and plows, held at Winnipeg, Can., July 2 to 20 inclusive. The event was well attended, attracting farmers from hundred of miles, and although 25 machines competed as compared with 27 of the previous year, it is interesting to note that a higher degree of efficiency was attained both in the gasoline and kerosene classes. The original entry list included 29 machines and of this number 25 competed, 13 being of the gasoline type, eight kerosene and four steam. Last year 15 gasoline machines took part.

The contest was decided upon economy brake and maximum brake test, plowing, design and construction, and an added feature of interest to this year's tests was the engine gang plow competition, when the various developments in the large plow outfits were tested to show the farmer what could be accomplished with a thoroughly modern equipment. The points upon which the judges made their awards were: Draft, evenness of furrow depth, lay of furrow slices, evenness of cut of inside plow, ease of adjustment and manipulation of plow in and out at ends, straightness of furrows, and stops attributable to plow.

The gasoline machines were divided into two classes: B, cubic piston displacement of 300 cubic feet a minute, was won by the product of the J. I. Case Threshing Machine Company, 411.7 points; C, gasoline, piston displacement of 500 cubic feet a minute, went to the Aultmann-Taylor machine, 447.7 points.

The heavy fuel machines were divided into two classes, D and E, for motors of 500 cubic feet and over 500 feet, respectively. The International Harvester machine was first in class D with 398.15 points, while the Rumely oil pull tractor captured class E with the highest number of points scored in the contest, 449.75. The Case steam machines won all three events for vehicles of this type, the highest number of points made being 442.85.

The grand prize for best all around performance went to the Rumely tractor of class E, rating over 500 cubic feet of piston displacement a minute. Gold medals were awarded the winners.

RUTENBER COMPANY EXPANDS.

The Rutenber Motor Company, capitalized at $1,350,000, has been incorporated at Marion, Ind., and will take over the business of the Western Motor Company, which has been producing Rutenber motors for a number of years. The new capital represents a large investment on the part of George W. Bowen of the Bowen Manufacturing Company, Auburn, N. Y., who is president of the reorganized concern. The business management, as well as the heads of the various departments, will remain substantially in the same hands as in the past, and with the additional finances available for buildings and equipment, the efficiency of the old organization will be increased to meet the needs of a rapidly growing business.

FIRE CHIEFS AT DENVER.

One of the principal subjects to be considered at the annual meeting of the International Association of Fire Engineers, to be held in Denver, Col., Sept. 17-20, will be the application of motor driven vehicles to fire fighting purposes. A large attendance of fire chiefs from all sections of the United States and Canada is expected. F. J. Connery, chief of the New Castle, Penn., fire department, will give a paper on "The Triple-Combination Hose Wagon, Chemical and Pumping Engine. Is It a Success?" John Kenlon, chief of the New York City department, and R. H. Bawker, chief of the Passaic, N. J., department, will give papers on "Tractors for Steam Fire Engines, Aerial Trucks and Water Towers," while James Smart, chief of the Calgary, Can., department will discuss "Motor vs. Horse Drawn Apparatus in Heavy Snows."

CONCERNING CARRYING CAPACITY.

Questions relating to the carrying capacity of a given chassis have decided interest for the prospective purchaser of motor trucks. It is a subject which has caused more or less difference of opinion among manufacturers, as well. The following communication brings up some new features, and suggests that a discussion of the matter might prove of benefit to the industry:

Editor, MOTOR TRUCK,
Sir:

There is a practise among automobile manufacturers to label their chassis with a certain carrying capacity and then sell and guarantee these chassis to carry that particular load, regardless of what kind of a body is placed upon the chassis.

Now if a chassis is designed and built to carry a load then there is a very great difference whether or not the load is carried in a stake body or in a dumping body with its consequent machinery. This comment applies especially to trucks of large sizes, particularly five or six-ton trucks.

If a chassis is built to carry five tons then that chassis should not be used to carry over five tons. On the other hand, if the chassis is built to carry six tons, it should be sold as a six-ton chassis, not as a five-ton chassis.

The practise which the writer believes to be wrong is to build a chassis, call it five tons and guarantee it to carry a five-ton load, whether the body which is to be placed on this chassis is an open one weighing 150 to 200 pounds, or whether it is a dumping body which will weigh over two tons. If a dumping body weighs 2200 pounds, then such a body put on a five-ton chassis cuts down the load carrying capacity of the truck to four tons and it is an injustice to somebody if this truck is sold as a five-ton truck when its real carrying capacity is only four tons, because of the fact that the body weighs a ton.

If the truck really is a five-ton truck then the purchaser who buys this truck and is induced to put on a dumping body weighing one ton and capable of carrying five tons, is being induced to overload his truck and such practise is bad. On the other hand, if the chassis is really built to carry six tons, then the purchaser who buys this truck with an open body is paying more money for it than he should pay because he is buying a six-ton truck instead of a five. This practise is all wrong.

The chassis should be labelled with the actual load that it is built and designed for and the weight of the body should be subtracted from this capacity when the actual load carrying capacity is figured. In other words, it is a question of net and gross load carrying capacity and purchasers are being misled every day in this connection.

We believe that it would be a good thing for the industry if your paper would start a discussion along these lines.

Yours very truly,
MORRIS R. MACHOL,
Gen. Mgr., Hydraulic Truck Sales Co.

New York City, July 27.

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R. J. Mackenzie has joined the Kelly Motor Truck Company, Springfield, O., as purchasing agent.

The Firestone Tire & Rubber Company, Akron, O., recently opened a branch in Montreal, Can.

The Rassel Motor Car Company, Toledo, O., has changed its name to the Toledo Motor Truck Company.

The Adams Bros. Company, Findlay, O., maker of Adams trucks, has opened offices at 68 Broad street, New York City.

The Universal Truck Company, Detroit, Mich., recently broke ground for the erection of a $60,000 service station.

The Clayton Machine Works, Lee Summit, Mo., agent for Flanders delivery cars, is having a large addition built to its garage.

Arthur Gibbons recently joined the commercial car sales department of the Velie Motor Vehicle Company's branch in Chicago, Ill.

The American Steam Truck Company was recently incorporated in Saginaw, Mich., for $500,000. The concern is manufacturer of steam motor trucks.

Mauer & Miller, Fort Wayne, Ind., agent for Reo trucks, made by the Reo Motor Car Company, Lansing, Mich., recently occupied a new garage at 17 Stevenson street.

The Dayton Body Company, Dayton, O., has purchased a building site upon which a new factory will be erected for the manufacture of automobile bodies of all types.

The Ford Auto & Truck Company has been incorporated in Clarendon, Va., with a capital stock of $25,000. The concern will do a general garage and public service business.

The Knickerbocker Motor Sales Company has been incorporated with $10,000 capital stock to take charge of the sales of the Knickerbocker commercial cars in New York City.

The Keystone-Automobile Exchange has been incorporated in Lancaster, Penn., with a capital stock of $100,000. The concern will manufacture a line of pleasure and light delivery cars.

The Speedwell Motor Car Company, Dayton, O., maker of the Speedwell line of trucks, has taken over the San Francisco agency, and has made it a branch. H. Harry Croninger will be the manager.

The White Motors Company, Kansas City, Mo., has entered new quarters at 15th street and the Paseo. Agency for the White line of trucks, made by the White Company, Cleveland, O., was taken recently.

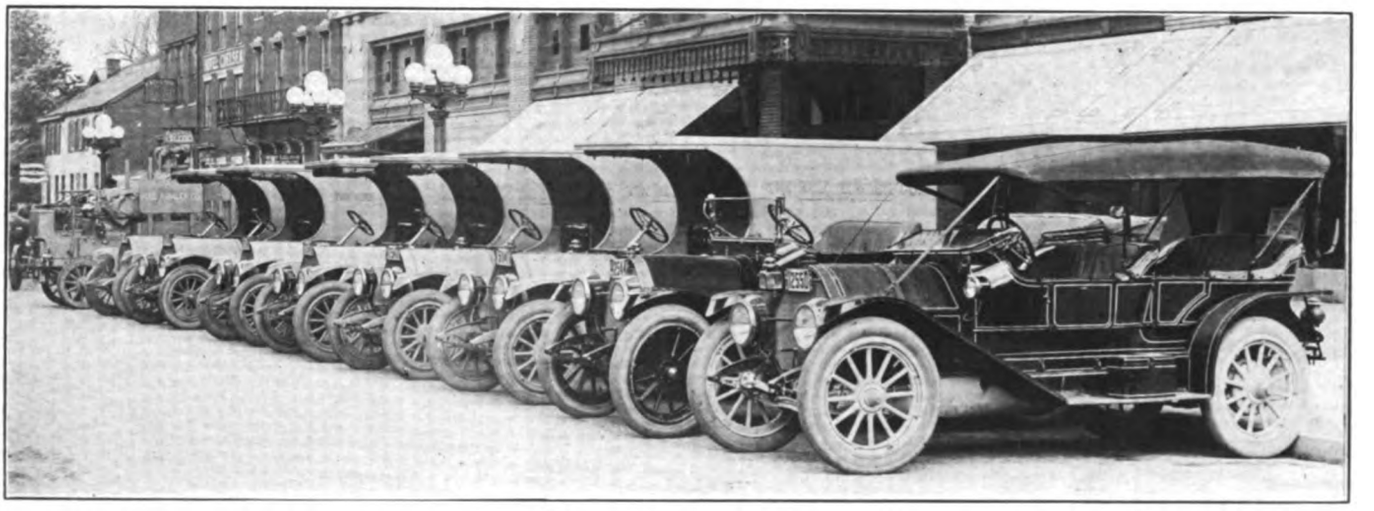
The Pullman Taxicab Company, Philadelphia, Penn., has plans under way for the erection of a new garage to cost approximately $25,000. The building will be 80 by 86 feet, and of fireproof construction.

The American Top Company, Jackson, Mich., manufacturer of automobile tops, has merged its business into a stock company with a capitalization of $350,000, and is considering an enlargement of its plant.

The Merchants Motor Service Corporation was recently formed in Philadelphia, Penn., with a capital stock of $100,000. The incorporators are William Vees, George B. Tets, George L. Oddy and Nathan W. Bushby.

The American Motor Freight Company was recently incorporated in New York City to do a general motor freight service. The capital is $25,000 and the incorporators are H. G. Waring, H. W. Bell and H. G. Phillips.

The Apple Electric Company, Dayton, O., is meeting with decided success with its Apico electric lighting system, particularly in the field of delivery wagons for department stores, etc. An accompanying illustration shows a fleet of Speedwell cars, made by the Speedwell Motor Car Company of Dayton, employed in the delivery service of the Rike-Kumler Company of that city, all of which are fitted with the Apico system. The owner states that the lighting equipment has been thoroughly satisfactory in every particular.



Delivery Equipment of the Rike-Kumler Company, Dayton, O., Fitted with Apico Electric Lighting System.

The C. & T. Auto Specialty Company, with a capital stock of $10,000, has been formed in New York City by George F. Connelley, John J. Treacy and John R. Hunt for the purpose of dealing in automobile accessories.

The Walker Tire Chain Company was organized recently in Toledo, O., with a capital stock of $150,000. The incorporators are Henry F. Rohrman, Charles A. Newman, Charles P. Eger, A. M. Edwards and George C. Bryce.

The Darwen Motor Truck Company, recently organized in Winnipeg, Man., to exploit the Commer truck in Manitoba, has opened permanent quarters in the Imperial Garage, Osborne place, that city.

Charles D. Schmidt, with headquarters at 416 Broadway, has been appointed sales agent for New York City and vicinity by the Baldwin Chain & Manufacturing Company.

The American Locomotive Company, New York City and Providence, R. I., maker of the Alco line of trucks, recently added the following new dealers to its list: H. T. Rogers, Binghamton, N. Y.; Six Thirty-Eight Tire & Vulcanizing Company, Memphis, Tenn.; W. H. Ash, Peekskill, N. Y.; George E. Stocking, Rochelle, Ill.; Geddes & Sheffield, Calgary, Alta., Can.; Taylor & Musson, Edmonton, Alta., Can.

The Crosby Company, Buffalo, N. Y., manufacturer of automobile frames and stamped metal goods, is having an addition

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made to its plant, 125 by 180 feet. The building will be four stories high and of steel construction.

The Taylor Motor Car Company, 7125-31 Kelly street, Pittsburg, Penn., has been organized by John Taylor, for the purpose of selling and distributing Lippard-Stewart light delivery wagons in Western Pennsylvania.

Federal Auto Accessories Company was recently formed in Columbus, O., by J. R. Loofburrow, H. M. McDonald, W. C. Wetherhold, E. J. Mace and M. L. Mace. The concern will deal in automobile accessories and supplies.

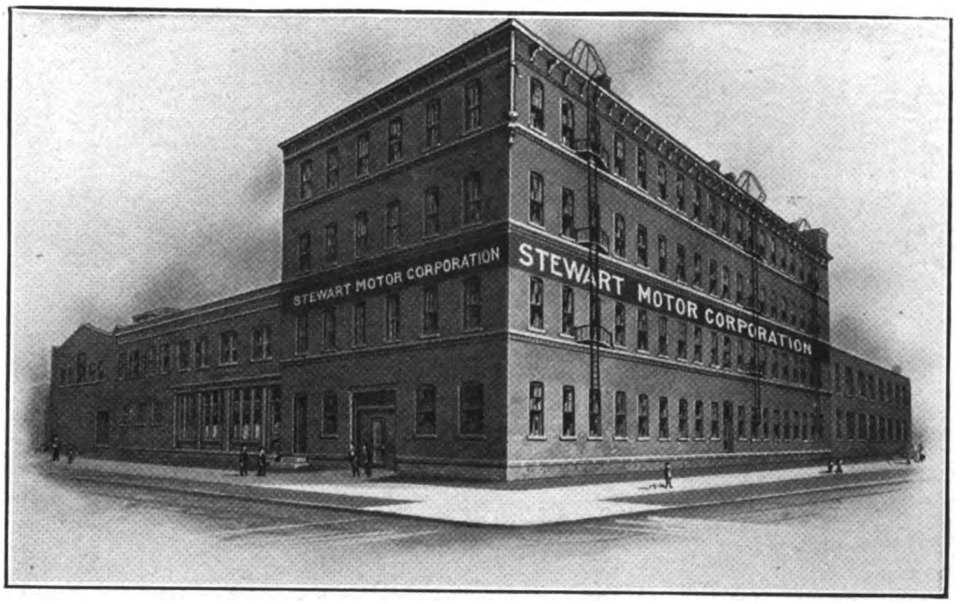
The Timken-Detroit Axle Company is having two large additions built to its plant in Detroit. That the company has bought land in Toledo, O., for the erection of a plant there, is denied by members of the firm.

The D. K. & D. Company was incorporated recently in New York City with a capital stock of $5000 for the purpose of manufacturing motors. The members of the concern are Eckford D. McKay, Sidney G. McKay and Andrew C. Dam.

The Waverley Electric Vehicle Company, Minneapolis, Minn., has been formed to handle the Waverley line of electric pleasure and commercial cars in that city and vicinity. Temporary quarters have been secured at 1526 Hennepin avenue.

The Kelsey Wheel Company, Detroit, Mich., manufacturer of automobile wheels, is erecting additions to its plant which will about double the floor space of the factory buildings. The new structures will include a main building 180 by 360 feet.

H. W. Yeager, president of the Yeager Piano Company, Hartford, Conn., recently took the agency for the complete line of Velie trucks, made by the Velie Motor Vehicle Company, Moline, Ill. His territory will include Hartford and vicinity.



Factory, Buffalo, N. Y., of New Stewart Motor Corporation, to Manufacture Light Trucks.

The Hawkeye Vulcanising Company was formed in Dubuque, Ia., a short time ago. It is planned to do a general vulcanizing business in a building on Fourth street. G. Whitney Williams and Arthur T. Schwaegler are at the head of the concern.

H. W. Evans was recently placed in charge of the truck business of the Locomobile Company of America, Bridgeport, Conn., on the Pacific Coast. Until his promotion he was in charge of the Locomobile company's San Francisco branch.

The Service Recorder Company has been incorporated in New York City with a capital of $10,000 for the purpose of manufacturing automobile devices. The incorporators are Harold F. Seymour, Frederick Seymour and Benjamin N. Levy.

The Electric City Specialty Company has been formed in Buffalo, N. Y., with a capital of $25,000, for the purpose of dealing in automobile specialties and accessories. The members of the firm are Joseph E. Stark, John H. Beer and Ida E. Stark.

M. Nabors and R. M. Northcutt recently took the agency for Alco trucks, made by the American Locomotive Company, Providence, R. I., and New York City, for Atlanta, Ga., and vicinity. They have taken quarters at 239 Peach street, Atlanta.

The Piano & Heavy Box Truck Manufacturing Company, Toledo, O., was recently formed, and has been incorporated with a capital stock of $20,000. A line of heavy trucks will be placed on the market. The incorporators are A. T. Raynor, W. F. Runkle and others.

The Motor Truck Company of Washington, D. C., recently secured the agency for the Atterbury truck, made by the Atterbury Motor Car Company, Buffalo, N. Y. The concern also has the agency for the Hatfield, made by the Hatfield Company, Elmira, N. Y.

The Seaton Wheel Company was recently formed in Nashville, Tenn., with a capital stock of $130,000, to manufacture all types of automobile wheels. The members of the firm are G. Jackson, Samuel S. Lord, B. C. Seaton, John T. Landis and J. Ray Boone.

The Worcester Spring Company, recently formed in Worcester, Mass., has a capital stock of $25,000. Springs for all types of motor vehicles will be manufactured. The members of the concern are Charles B. S. Jackson, G. A. McKenzie and C. E. Sampson.

The General Motors Truck Company will soon erect a service building at Fort and 12th streets and Lafayette boulevard, Detroit. It will be one story in height and have a frontage of 700 feet on each of three streets. The cost will approximate $700,000.

The General Vehicle Company, Long Island City, N. Y., has moved its Chicago office from 417 Rookery building to the sixth floor of the Otis building, LaSalle and Madison streets. The new office will be in charge of W. W. Witherby, who succeeds P. C. Chrysler.

The Eureka Motor Car Company, 218-220 Adams avenue, Scranton, Penn., is building an addition to its garage, 85 by 40 feet, this being made necessary because of the recent increase in the company's business. The concern has the agency for Speedwell trucks, as well as a line of pleasure vehicles.

The White Company, Cleveland, O., maker of the White truck, will open a factory branch in the building formerly occupied by the old White agency, Sixth and Madison streets, Portland, Ore. Charles R. Williams, formerly manager of the Winton branch in Seattle, will be in charge.

Universal Motor Truck Company, New York City, has been taken over by the parent company in Detroit, and in the future will be operated as a factory branch. F. K. Parke of the parent company has become president of the New York branch, of which H. H. Walton, the former president, is vice president and general manager. Samuel Mann is treasurer and George Wheeler, secretary.

The Chase Motor Sales Company was recently formed in Philadelphia, Penn., to take over the agency in the city and Montgomery county for the Chase line of trucks, made by the Chase Motor Truck Company, Syracuse, N. Y. J. A. Rogers will act as manager. Salesrooms and a service station have been established at Broad and Wallace streets. A similar station will also be established at 50th and Washington streets, West Philadelphia.

The General Motors Truck Company recently opened a new branch and service station in St. Louis, Mo. O. E. Stoll is in charge as manager.

Waite's Motor Vans & Storage Company, New York City, has been incorporated for $25,000 by Francis T. Germain, Philip J. Dunn and Louis Burgess. It is the intention of the company to do a general automobile storage business, with particular attention to motor vans and trucks.

The Kenton Gas Engine Company has added a motor car repair department to its plant in Kenton, O., and is prepared to do work on trucks as well as pleasure vehicles. The company will handle a full line of accessories and will have the agency for Knight tires. T. A. Taylor is the general manager.

The Auveco Company was formed recently in Buffalo, N. Y., for the purpose of opening a pleasure and commercial vehicle garage and salesroom. The officers of the concern are Otto A. Magelin, Thomas LaVere, Walter W. Miller, W. H. Rodenhouse, James Fox, Forbes Foster, Fred Baker, Frank H. O'Neill, James Mora, W. H. Gentz and Henry G. Walters.

The Newark Auto Truck Manufacturing Company has been formed in Newark, N. J. The members of the concern are L. W. Babbage, H. H. Poole and John T. Walsh. The company will introduce a new motor truck to the trade, to be made in Newark.

Mark E. Couch is organizing a stock company in North Adams, Mass., for the purpose of manufacturing chains for automobile and truck wheels. The output will be similar to that of the Whitney Manufacturing Company, Hartford, Conn., with which concern Mr. Couch was connected for several years.

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The MOTOR TRUCK
Devoted to Motor Driven Business Vehicles of All Classes.

VOL. III. PAWTUCKET, R. I., SEPTEMBER, 1912 No. 9

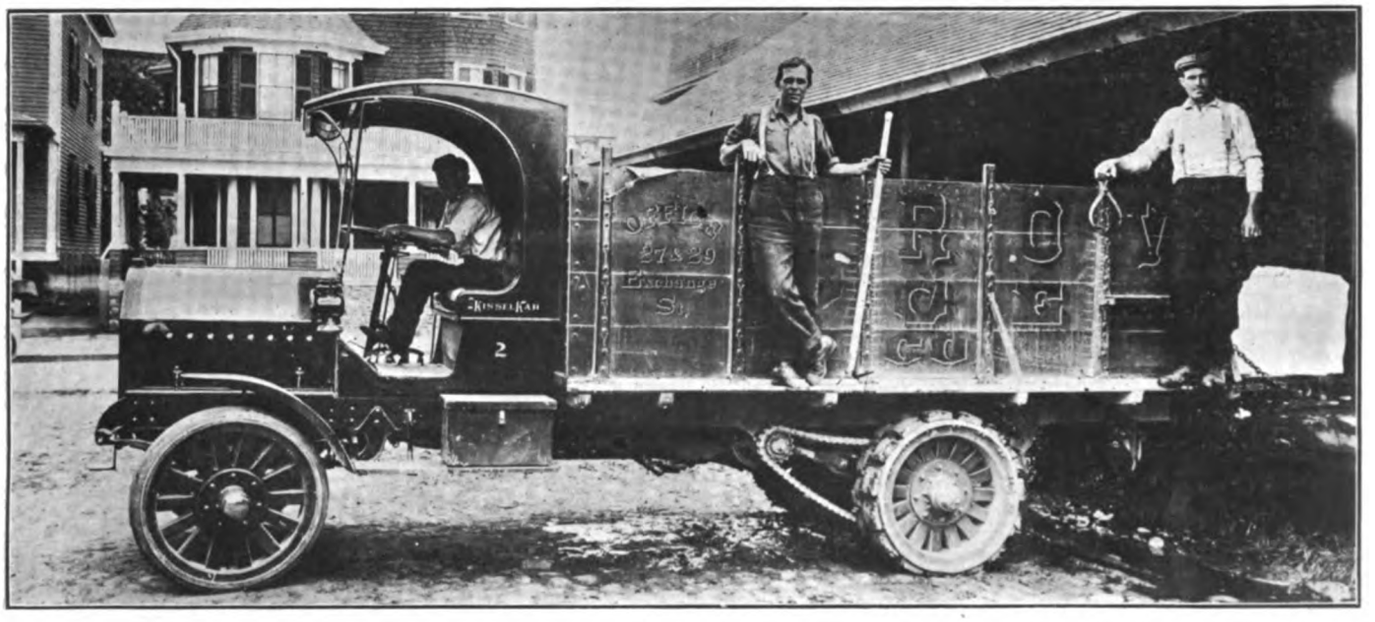
MOTOR TRUCKS ECONOMIZE ICE HAULAGE.

Providence, R. I., Company Reduces Cost of Supply Service and Utilizes Large Reserves That Had Been Generally Wasted Because of the Expense of Carting--- Practical Use of Vehicles Yields Large Returns.

MAKING profitable the distribution of thousands of tons of ice that previously was permitted to waste, as well as hauling thousands of tons at a decidedly decreased cost, and largely economizing special and emergency deliveries, the Providence Ice Company, Providence, R. I., has found its power wagon service to be one of the best investments it has ever made. Its installation is not what might be regarded as large, but it has been found to be remarkably efficient.

Not only this, it is the intention of the company to work its trucks and wagons all of the time, instead of by seasons, and it should be understood that from Nov. 1 to May 1 it has, as a rule, but partial work for its animals and they are the least productive. It would appear that the horses could be worked without so much regard to productiveness during this period, but the company believes that the trucks and wagons are so much more economical that it would be best to utilize them constantly.

The company harvests each year when a full crop is possible, from 200,000 to 225,000 tons of ice, and this is stored in houses in Rhode Island and Massachusetts, some of these being 60 miles from Providence. The majority, however, are within 25 miles. All of these ice houses are located with reference to shipping the ice by railroad and of course it is usually necessary to haul the ice from the houses to the cars, pack it in the cars, and these cars are received at either of the two storehouses in the railroad yards at Providence. As may be imagined, very advantageous freight rates are secured from the railroad company when thousands of tons are shipped each year.



Kissel Four-Ton Truck in the Supply Service of the Providence Ice Company, Delivering a Freight to the Burnett Street Station.

Beginning with the season for general consumption, about May 1, these distant houses are drawn upon, so that these supplies are usually first exhausted, and then as needed the supplies nearer the city are utilized.

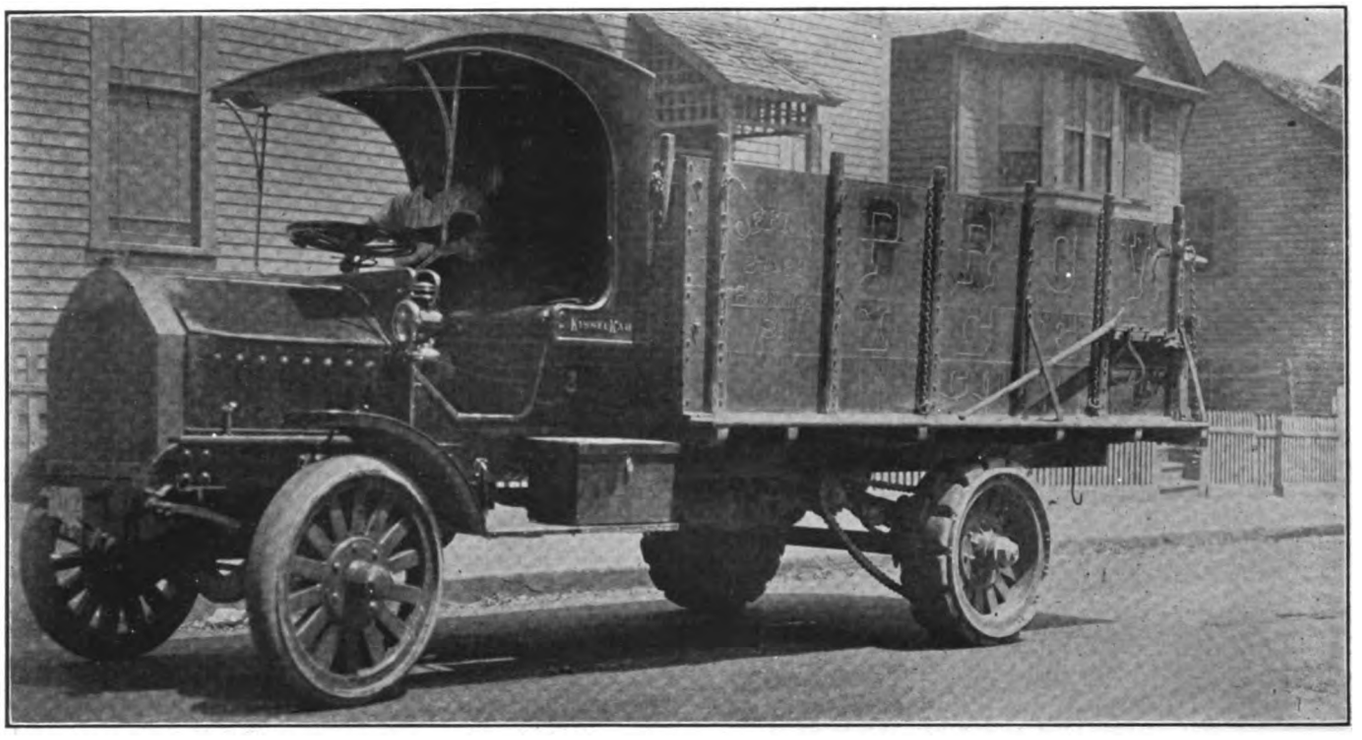
The company is the principal dealer in Providence and it was formed by consolidating several concerns.

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It has been organized with a view of giving the most complete and economical service possible. Instead of a single point from which to make distribution it maintains no less than nine stations, each of which to a large extent is independent of the other. At the ice house plant at Mashapaug pond is a large stable, a blacksmith and wheelwright shop, a harness shop, and large stores of supplies and material are maintained there. Not far from this is the Burnett street station, where about 30 horses are used for delivery; next in importance is Knightsville, in the city of Cranston, where about 20 horses are used; at East Providence and at Ponsegansett in the town of Warwick about 10 horses are in service at each place; at the Ethel street station in Providence eight horses are kept busy, and at the Wanskuck station in Providence seven horses are regularly used. In addition to this is the service from the Mashapaug stable.

at Hughesdale and at North Providence. At Hughesdale are two different plants, known as Upper and Lower Hughesdale, and at North Providence are two that are known as Angell and Swallow. The Hughesdale houses are approximately four and 4.25 miles from the Ethel street station and approximately five and 5.25 miles from the Burnett street station. The Swallow and Angell ice houses are each about four miles from the Harris avenue station and a trifle less than that distance from the Promenade street station.

It was the custom of the company for a number of years to haul the ice from the Hughesdale ice houses to Ethel street and Burnett street, from which a large part of the family trade is supplied, with wagons, occasionally sending loads to the Harris avenue station as well. This work was done by what were known as supply wagons, each having five tons capacity and being drawn by four horses, but because of the character



Four-Ton Kissel Truck En Route for the Hughesdale Ice Houses for a Load for the Harris Avenue Station.

At Ponsegansett, Knightsville, Mashapaug, East Providence and Wanskuck are ice houses where ice is stored, and from which distribution is regularly made. The Mashapaug ice is used by packers and for refrigerating only. The ice distributed in the business district of the city is received largely from the houses outside of the city by railroad, and is taken from the houses in the railroad yards at Harris avenue and Promenade street, and from the other stations, and from the Burnett street and the Ethel street stations distribution is made to the families. It will be seen that it is necessary to haul all of the ice needed for the last two stations named, and to supplement any demand on the Harris avenue and the Promenade street stations that may be beyond the supply available.

The ice cannot be taken from any of the other stations and it is necessary to draw upon the ice houses

of the highways four tons was the normal load and two round trips could be made daily, this making the haulage of four horses for the day eight tons.

With two trips to Burnett street it will be understood that the mileage was in excess of 20 miles, which was regarded as the limit to which animals could be worked, even with the excellent care given them. With one trip to Burnett street and one trip to Ethel street the mileage was reduced about 11 per cent., but the productiveness of the animals was no greater because no more haulage could be done. The mileage to the Harris avenue station is about the same as to Burnett street. It will be seen from this condition that it actually cost more to haul ice to Ethel street than to Burnett street and Harris avenue, because a part of the time of the men and animals could not be utilized and was absolutely lost, and it was not possible to em-

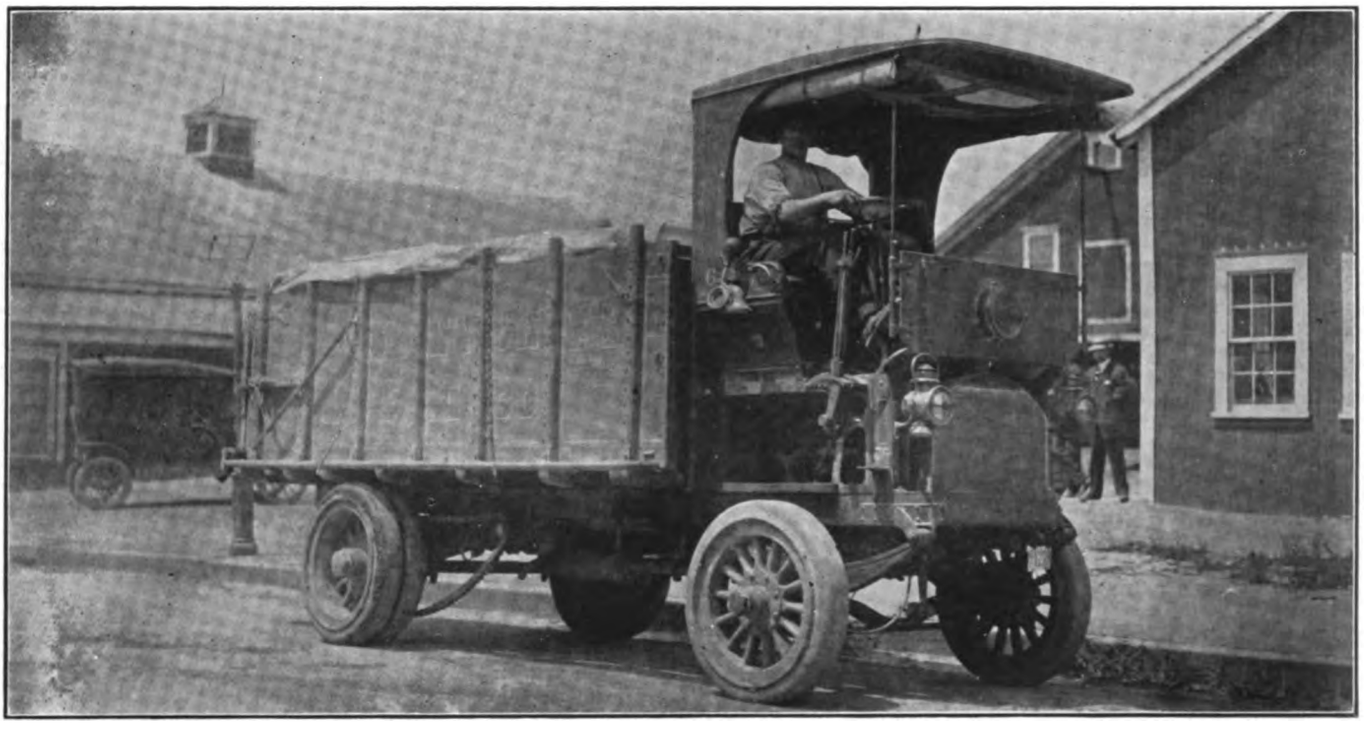
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ploy them in other work. Yet these stations, at least all but Harris avenue, could not be supplied with ice from any other source with less expense, and so it was necessary to haul it over the road. As might be imagined, it was necessary to have a number of wagons in this work, and allowing a price of $7 a day for four horses, a cart and a driver, which is less than the cost for such an outfit to the average ice dealer, this would make the expense of haulage of ice approximately 87.5 cents a ton for either a four or five-mile haul, or, based on ton miles, the cost would be 21.875 cents for four miles and 17.5 cents for five miles.

While it was necessary to have this ice it will be understood that the cost of haulage was at least equal to and often times in excess of the expense for ice taken from ice houses in the country and shipped by railroad, not considering excessive shrinkage. That is, aside from the cost for hauling and handling in shipping the ice, with the price established for large haulage, the ice, unless there was large shrinkage, could be placed in the carts for delivery cheaper than the Hughesdale crop. Not only this, the cost of haulage from the Angell and Swallow ice houses was approximately the same to Harris avenue as from Hughesdale to Ethel street, and to haul this ice to the Ethel street and Burnett street stations would cost so much that it was regarded unprofitable to handle it, unless in the event of an emergency. Each year the houses were filled, but this was merely a reserve in the event of a shortage, and in some instances ice is kept for several years, or until it became practically a solid mass and was broken out with explosives, or permitted to melt.

With the different stations of the company it is always practical for the drivers of carts to return to that to which they are attached and secure whatever may be necessary to supply their customers, and it is not unusual in hot weather for the men to take out as many as three and sometimes four loads. Where the ice is available in the houses it can be taken out as required, but where the supply must be hauled, as at the stations named, it is necessary to have the supply service prompt and certain. Naturally, in the weather when the demand is the greatest the largest quantity must be hauled, and at such a time the work is more severe on the horses and men as overtime is necessary to keep up with the distribution. But no matter what the expense or the strain upon the animals the work must go on. In the extremely hot period of 1911 the company lost a number of horses simply because it had to work them to excess. The delivery service is, of course, worked under a corresponding pressure under such circumstances.

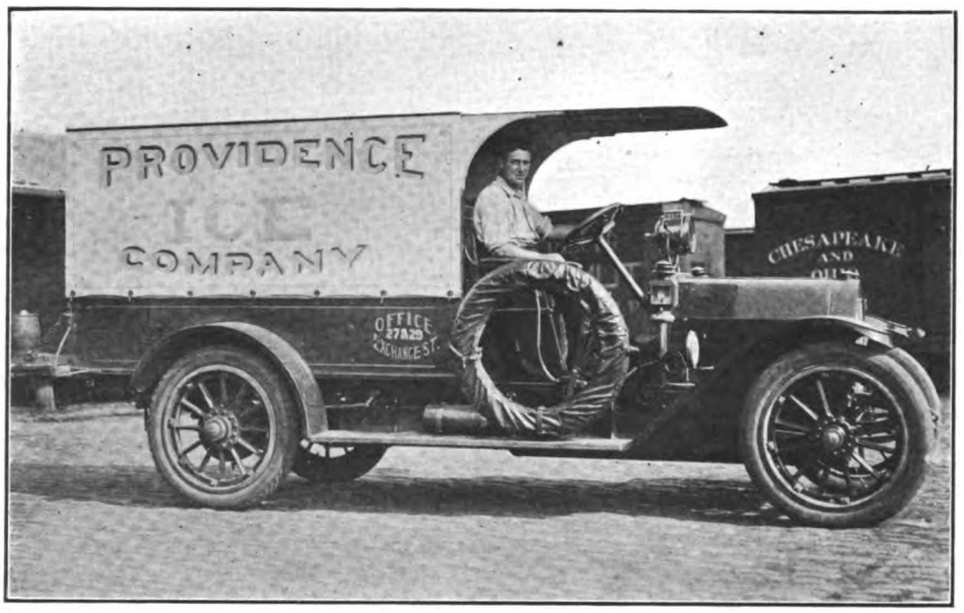
This season the company has in service three trucks and a 1500-pound delivery wagon. These trucks are now engaged in haulage from the Hughesdale house to the Burnett street and Ethel street stations, with occasional trips to the Harris avenue station and making wholesale deliveries. They are doing the work of at least eight four-horse teams and wagons, and the delivery wagon is doing at least the work of three single horses and carts, so that the four vehicles are doing what would require approximately 35 horses, considering there would be need of spare animals, and that the animals were worked to their capacity.



Five-Ton Mack Truck, the First Machine Employed in Regular Haulage by the Providence Ice Company.

The company is using two KisselKar trucks of four tons capacity each, a KisselKar delivery wagon, and a Mack truck of five tons capacity. These machines are working on the Hughesdale haul now, and will continue until the supply at these houses is exhausted. Then the supply at North Providence will

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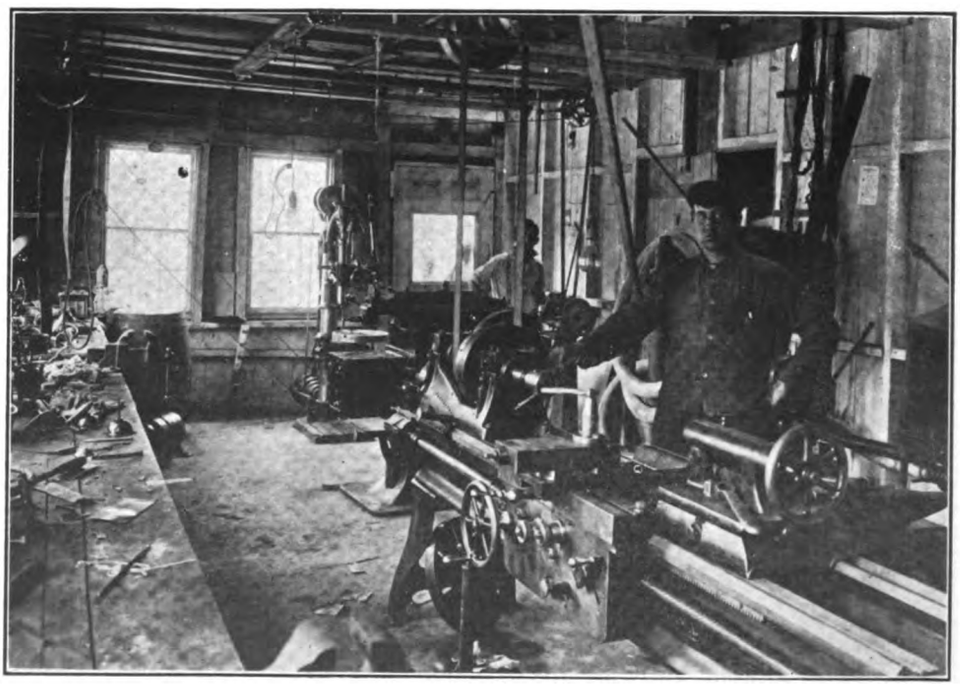
The 1500-Pound Kissel Delivery Wagon Used for Special, Emergency and Sunday Service.

be drawn upon. One of the KisselKar trucks is making five round trips three days of the week and six round trips three days of the week, or 33 loads of four tons each, this machine being driven from 60 to 65 miles daily. The other KisselKar is averaging five trips a day, or 30 four-ton loads a week. The third truck is hauling on an average of five trips a day, five-ton loads, although this is frequently broken to take care of wholesale deliveries. This applies to regular work and not to overtime requirements.

Considering this work for a moment, it will be understood that the first truck is doing the hauling for which 2.75 four-horse teams would be needed, the second is doing what would require 2.5 four-horse teams, and the third what would necessitate 3.25 four-horse teams, or 8.5 teams all told, this alone calling for 34 horses daily and nine drivers. Allowing the expense of operating the trucks to be $12 a day, and figuring the cost of a four-horse team, wagon and driver at $7, it will be seen there is a material economy, for the horses would cost $59.50 as against $36 for the trucks, and by this the cost is reduced from 87.5 cents a ton to 54.5 cents a ton, while the shrinkage is reduced from five per cent. with horses (average), to one per cent. with the trucks.

The figures stated for horse maintenance should be applied only to this company, for it maintains its equipment with great economy. The horses may be averaged in price at $350, a wagon at $300, a set of harness at $75, making the total cost of a supply wagon outfit about $1850, and the daily cost of keeping the horses and paying a driver $2.25 a day is estimated at $7. The company has its own facilities for building and repairing its wagons, doing its own blacksmithing, painting, harness repairing, horseshoeing, and it purchases its materials and supplies in large quantities, saving from every angle, while it keeps its labor expense at a correspondingly low figure. So the trucks are placed against the lowest possible horse cost. The company depreciates its horses at 20 per cent. a year. This may be varied from, for horses have been used for 20 years, but five years is a reasonable period of service for animals.

Relative to the use of horses it has been found that they last much better in cart delivery work than in the long hauls, because they have intervals for rest, and while the work may be a good many hours a day for a part of the year, it is not as hard as when they have to do steady pulling. The experience is that after the season's active work the horses have a chance to rest, and then they are sent out for the ice cutting, which may be from nine to 12 weeks. During the actual cutting the horses are worked sometimes 18 hours a day, because of necessity, and at the end of the winter they are well used up and need all the time permitted for them to recover their strength and spirits. So



The Finely Equipped Repair Shop Maintained by the Providence Ice Company in Connection with Its Motor Wagon Department.

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while there may appear to be a long time when the animals are not worked hard, as a matter of fact they have to have the rest to endure in the service. And what may seem to be a surplus of horses after the summer season has passed cannot be disposed of. Good horses are too difficult to get and good ice delivery animals are especially valuable.

When the Hughesdale ice houses have been emptied the North Providence houses will be drawn upon. It will be seen that with practically the same haul as from Hughesdale to Burnett street and Ethel street, and with an eight-mile round trip from Harris avenue, the cost of haulage with horses was practically prohibitive, but with the trucks this ice can be hauled with the same reduction of cost as from Hughesdale.

The 1500-pound KisselKar wagon is stationed at the Harris avenue station to make all sorts of special trips and emergency calls, carrying from a full load to a few cakes. Usually it is in service from 8:30 to 7 daily, but Saturday nights it is worked until 11 at night. It serves from 20 to 70 customers a day, and Sundays it is utilized to make from 20 to 25 deliveries. It does more than the work of three single wagons. When sent on emergency calls the driver frequently telephones the office and is given orders received after he began the trip, and in this way economizes time and increases the efficiency of the service. Sometimes it costs the company 50 cents to deliver a 10-cent piece of ice, but it has been possible to attract customers by quick service that compensates for this many times. Not only this, there is considerable economy in the time of the men who might be compelled to make long trips with horses, or lose time delivering special orders.

The company experimented with a truck last year, buying the Mack five-ton machine. This was worked with horses in the Hughesdale haul and at the end of the season, Nov. 1, careful account was made of the work that it had done and the cost of this contrasted with the cost of this haulage by horses. It was found, after allowing depreciation at the rate of 20 per cent., the truck had saved $1100, not considering that there was a reserve capacity that was superior to animals, not estimating the value of this reserve in the particular work in which it was engaged, not considering the saving when the machine was withdrawn from service, a matter of at least $10 a day, not computing the saving in ice shrinkage, not regarding the accommodation to customers, and not accounting for the depreciation in animals or the cost they would represent.

It was upon this practical demonstration that the company purchased the KisselKar trucks, which were delivered to it early in May, and which have been in actual service daily since then. Because of the contract under which the machines were bought and the contract made for tires it is impossible to state maintenance and upkeep charges, but the tire cost is estimated on the basis of the guarantee.

The company has its garage at Burnett street, where it has a well equipped repair shop with a high class mechanic in charge. He is expected to maintain and repair the trucks and machines, there being a Buick errand wagon and two pleasure cars that are used for the company's business, and when a driver is unable to report he takes the man's place temporarily. He is given whatever assistance may be necessary in his work. The shop has a fine lathe, a shaper, a drill press, an arbor press, a grinder and a forge, and the power is an electric motor. Stock and materials are kept on hand for making any part that may be necessary and of course there are the usual hand tools.

The garage is in charge of a watchman at night, and he washes the machines and makes the replenishments of gasoline and oil, so that the machines are ready for the start in the morning. Each day each driver fills in a card, an example of which accompanies this article, which gives every information of his work. The

PROVIDENCE ICE COMPANY
DRIVER'S DAILY CARD

Date 19

Truck No.

Speedometer Reading Miles

Gasolene Gals. Oil Qts.

Alcohol Qts.

Trips

To From

Time Left Garage A. M.

Time Returned P. M.

Remarks

Driver

Providence Ice Company's Driver's Daily Report Card, Printed on Manila Card, Eight by 3.5 Inches.

loads are not weighed, but each driver is expected to carry the capacity of his vehicle, and no more. If the trips are not what is demanded by the service an explanation is necessary. These cards are filed and it is possible to learn at any time what was done on any day and for a specified time. The distances have all been established by an odometer record and are accurately known.

In working the trucks the driver has no helper, but there are helpers at the place of loading and unloading and the arrival and departure of the machines are so timed they are at no place together. While the trucks are absent the helpers are engaged in other work, so no time is lost. This is decided economy compared with the helpers riding about on the trucks and working but a part of the time.

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WHAT IT COSTS TO MAINTAIN HORSES.

That those who are depending upon horse drawn equipment have no accurate means of knowing just how much it costs for haulage has been evident ever since motor truck salesmen began trying to interest business men in the economy to be secured through the use of the mechanical transport. To illustrate: It may be cited that some of the oldest and shrewdest men in the drayage business in Boston have been letting out a driver and pair of horses, with all the necessary paraphernalia, for $6 and $7 a day, while those who made a charge of $10 were considered as among the grasping.

In an effort to learn just how the matter stood the Team Owners' Association of that city recently invited W. H. Jarvis of Jarvis, Crawford & Co., a certified public accountant, to address its members upon the subject of horse maintenance, the facts being gleaned from his experience in going over the books of concerns operating fleets of horse drawn vehicles.

Mr. Jarvis brought out some facts very clearly. To start with, there are 365 or 366 days in the calendar year, and the horse, taken as a unit, must be fed, housed, maintained and cared for during each day, although to get its earning capacity, excepting the unusual occasions of a few Sundays or night work, there should be a deduction of 52 days and nine for holidays, a total of 61, leaving 304 effective days. This is actually a reduction of 16.6 per cent., or one-sixth.

Taking for example an installation of 200 horses, there must be from four to six animals for the use of managers and foremen in properly directing the work, and there must be spare horses for use in case of sickness or accident. Mr. Jarvis suggests that 20 is a liberal estimate, and that gives 10 per cent. of unproductive horses. Thus it is that the actual efficiency of the animals is reduced to 75 per cent.

He finds that it costs at present $19.87 a month to feed a horse, making a total cost of $3974 a month for the 200 horses. Since there is an efficiency of only 75 per cent., Mr. Jarvis gives the daily feed bill of a horse as 90 cents, whereas as a matter of fact one horse eats but 66 cents worth according to his figures. Other items in the table below are computed accordingly:

	Single Team.	Double Team.
Driver's pay	$2.00	$2.50
Feed	.90	1.80
Rent and stable	.31	.62
Shoeing and small repairs	.19	.38
Claims, accidents, tolls, etc.	.18	.36
Foremen and helpers, pro rata	.18	.36
Other helpers	.20	.40
Repairs, harness and painting	.13	.26
Manager or superintendent, salary	.10	.20
Office rent, telephone, clerks	.31	.62
Miscellaneous, veterinary, etc.	.24	.48
Fire and accident insurance	.08	.16
Depreciation	.20	.40
Totals	$5.02	$8.54

Three leading merchants in Minneapolis, Minn., have demonstrated the advantage of a co-operative delivery system in which six KisselKar trucks, made by the Kissel Motor Car Company, Hartford, Wis., play a prominent part. One of these machines makes five calls daily at each of the stores, collecting the packages and taking them to a central distributing station, at which they are sorted and assigned to the five others, each of which makes three delivery trips daily. The cars are manned by a neatly uniformed driver and assistant, and it is said that the cost of delivery under this system is about half of that under the old arrangement with horses.

LOAD RATING AND CHASSIS WEIGHT.

Interesting Compilation Showing Average with 329 Gasoline and 49 Electric Vehicles.

The subject of load rating and chassis weight, and their relation to each other, is one which is being given serious consideration by both manufacturer and owner. In order to arrive at some definite result as to what has been accomplished along this line, the commercial vehicle committee of the National Association of Automobile Manufacturers has prepared the accompanying table, which sets forth the various load capacity ratings as supplied by the makers of 325 gasoline and 49 electric commercial cars.

For example: The average of the chassis weights of 49 different makes of three-ton gasoline wagons is 5509 pounds. To bear a uniform relation to the average weights of all other capacities the weight should be 5600 pounds. But the average of actual weights of 10 well known and successful makes of three-ton trucks is 6700 pounds, which exceeds the average of the 49 by 470 pounds. The table follows:

Gasoline Vehicles.

Capacity rating. (Pounds.)	No. of models reported on.	Average actual chassis weight. (Pounds.)	Means of all chassis weights. (Pounds.)	Average weight of 3 to 10 leading makes. (Pounds.)
500-800	11	1,221	1,300	1,373
1,000	23	1,786	1,780	1,728
1,200	10	1,880	2,000	....
1,500	34	2,190	2,400	2,331
2,000	46	2,986	2,900	3,230
3,000	30	3,727	3,750	3,536
4,000	44	4,505	4,500	4,721
5,000	4	5,125	5,050	5,233
6,000	49	5,509	5,600	6,070
7,000	10	6,080	6,100	6,100
8,000	16	6,423	6,550	6,500
9,000	3	6,381	7,000	....
10,000	32	7,603	7,400	8,232
11,000	1	7,800	7,750	....
12,000	4	7,920	8,150	....
13,000	3	8,966	8,550	....
14,000	2	8,700	8,900	8,700
15,000	..	....	9,300	....
18,000	..	....	10,500	....
20,000	3	11,240	11,250	9,860
		Electric Vehicles.		
500-800	7	2,375	2,375	2,540
1,000	11	2,755	2,750	2,700
1,500	3	3,518	3,300	3,350
2,000	7	3,525	3,800	3,716
2,500	4	4,270	4,300	....
3,000	2	4,124	4,750	....
4,000	6	5,592	5,600	5,439
5,000	..	....	6,250	....
6,000	1	7,000	6,900	7,000
7,000	4	7,439	7,400	7,851
8,000	..	....	7,850	....
10,000	3	8,438	8,700	8,438
12,000	1	10,000	9,500	....

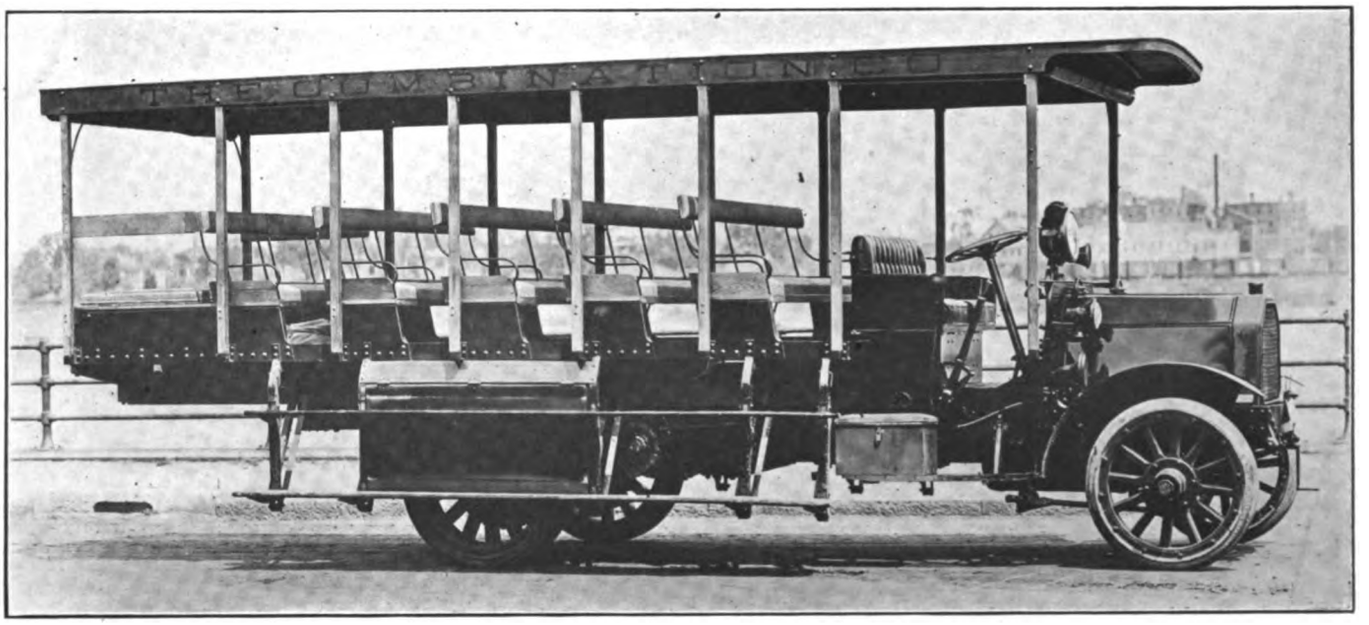
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PEERLESS FOR PORTO RICO.

Interesting Body Equipment to Be Utilized Instead of Trolleys in the Vicinity of San Juan.

Three three-ton Peerless truck chassis, made by the Peerless Motor Car Company, Cleveland, O., will take the place of a trolley service in the environs of San Juan, Porto Rico, the Peerless Motor Car Company of England, with headquarters in Boston, having delivered the order during the past month. An accompanying illustration presents one of the vehicles, all of which are fitted with 30-passenger bodies. The chassis is painted bright yellow with black stripings, but the woodwork is all finished in oil on the natural wood, since it has been found that this treatment withstands the climatic conditions of Porto Rico better than the usual paint and varnish finish.

The seats are furnished with removable spring cushions, covered with rattan. There are five of full width back of the driver's seat and two shorter seats in the baggage compartment at the rear. The top is somewhat similar to that of an open street car, and is furnished with pantasote curtains mounted on spring rollers and running on wire grooves supporting the roof. This provision makes it possible to enclose the passengers completely during a sudden shower. The two running boards on each side are arranged to fold up out of the way when not in use. The dash is equipped with a large swivel searchlight, and a hand operated siren horn.



Three-Ton Peerless Chassis Fitted with Special Body for Passenger Service in San Juan, Porto Rico.

The motor truck is slowly but surely finding its way into every corner of the civilized world, and one of the latest sections in which the commercial vehicle is being tried with success, is Alaska, which only a few years ago was considered a wilderness. Ever since the construction of the White Pass & Yukon Railroad, a stage line has been maintained between the northern terminus and Dawson, during the closed season along the Yukon river. This line has required the services of between 350 and 500 horses and a large number of men to operate it successfully. Recently, the management purchased a two-ton Knox truck, made by the Knox Automobile Company, Springfield, Mass., and although the trail is decidedly rough and with many steep grades, the car gives every indication of being the forerunner of the complete motorization of the line.

INTERESTING TIRE TEST.

An Effort to Determine the Type Best Adapted for Service on Light Delivery Wagons.

A series of tests to determine the average length of life of three standard types of tires on light delivery trucks recently was completed by the engineers of the Motz Tire & Rubber Company, Akron, O., the trials extending for a period of several years. Cars in the service of some of the largest retail houses in the country were utilized for this purpose, and the tires employed were solid rubber, pneumatic and the special cushion type made by this company. The trucks were divided into relays, each type of tire being utilized in the same order on each. That the firms represented by these cars have since adopted the Motz cushion tire appears to be sufficient evidence that the tests were most convincing.

It is claimed by the company that the result was a double victory for the Motz tire, in that it was found that these so conserved the mechanism of the machines that breakage of parts in all tests amounted virtually to nothing. It is further stated that the tests showed a substantial saving in the cost of tire equipment, covering the long time period of the experiment. Additional and specific data are promised in the near future, and will be awaited with interest.

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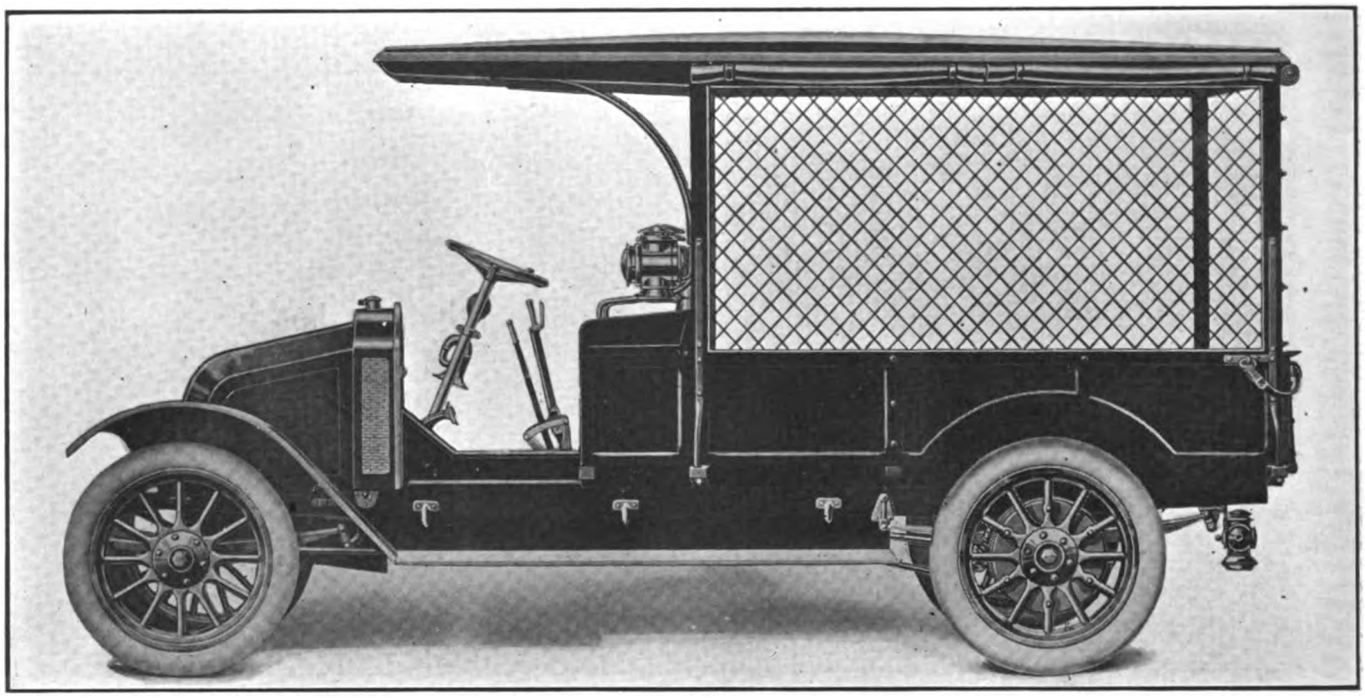
NEW STEWART LIGHT DELIVERY WAGON.

THE Stewart Motor Corporation, Buffalo, N. Y., has placed in the market its first production, which is a chassis having a load capacity of 1500 pounds, this being fitted with six different types of bodies as standard equipment. The wagon is offered as a high grade machine, having every desirable quality so far as design is concerned, and the material and workmanship are maintained to be the best that is obtainable.

The Stewart Motor Corporation is a new organization, but it is composed of men who have been for a long time identified with the industry. The president and general manager is T. R. Lippard, R. G. Stewart is vice president and chief engineer, R. P. Lentz is secretary and treasurer, and Robert W. Ingersoll is sales manager. Of these men Mr. Lippard and Mr. Stewart formerly were the promoters, organizers and the executives of the Lippard-Stewart Motor Car Company, which is located at Buffalo; Mr. Lippard being vice president and general manager, and Mr. Stewart the chief engineer. That company was formed for the purpose of building light delivery vehicles from designs made by Mr. Stewart, and it became widely known from the general character of the wagons manufactured.

Previous to this connection Mr. Lippard was general manager of the Franklin Automobile Company, and Mr. Stewart was connected with the same concern in an engineering capacity, and before that he was of the engineering staff of the Olds Motor Works, and of other companies. From these associations it will be realized that Mr. Lippard and Mr. Stewart have had wide experience, and with their knowledge of the demands of the people have built a type of vehicle that is expected to meet the requirements of a very large class that can use a comparatively fast wagon, that will have limited capacity and be enduring and economical in its operation.

The proportion of business men whose delivery is over a considerable area is very large indeed, and it is necessary that they be as prompt in their service as their competitors. The Stewart wagon is designed to carry loads up to its capacity at speeds that are permitted by laws and local regulations, and with an economy that is marked when the work is considered. The purpose was to build a vehicle that would be simple in its construction, with sufficient margins of safety to insure endurance, and with power adequate for all requirements, while its cost of operation and maintenance would be comparatively small.



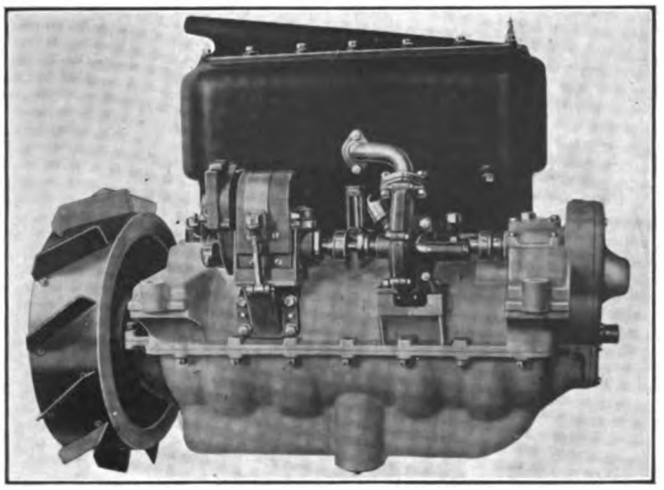
The Stewart Light Delivery Wagon, 30 Horsepower, Fitted with a Special Express Body, Having a Capacity of 1500 Pounds.

When the Stewart Motor Corporation was organized its product was decided on and much care and attention was directed toward perfecting a machine that would be in every way satisfactory, and after a period of experimentation the Stewart wagon was developed to a state where it was ready for the market, with the guarantee of the maker that it would be in every way a thoroughly dependable and reliable vehicle. It is claimed for the wagon that it is big, roomy, high grade in every detail of construction, and that it has more desirable standard qualities than any other vehicle offered in the market irrespective of price. It is also maintained by the maker that the machines are so well built that they should be serviceable for an unusually long period.

The factory organization is complete in every respect. The plant is large and has been equipped with

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ample machine tool facilities, the workmen are well trained and thoroughly experienced men, and it is expected to build the machines in large numbers. The



The Right Side of the Motor of the Stewart Delivery Wagon Chassis.

initial shipments will be begun early in September and with a standardized vehicle the production ought to be large. It is not expected to produce yearly models. It is believed that it is best to concentrate on one type of chassis and to add to it whatever may be regarded as desirable whenever a perfection has been found to be practically worth while.

In the design of the Stewart wagon it was Mr. Stewart's purpose to produce a vehicle that would be simple from every point of view, and with the units so arranged that they would be easily accessible and quickly removable, that the time for making examination or restoration might be minimized whenever work was necessary, and the cost of labor economized. While a comparatively light wagon it was proposed to have the highest degree of endurance and to insure the largest measure of service.

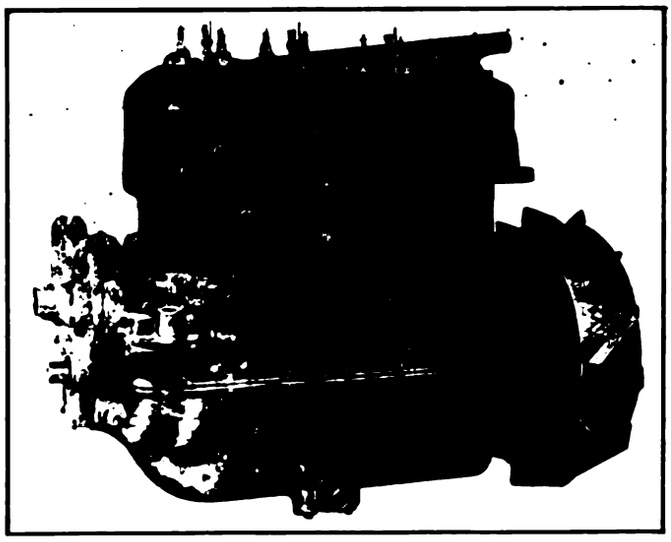
The motor selected is a Continental production of the vertical L head, four-cylinder, water-cooled type, with a bore of 3.75 inches and 5.25-inch stroke. This engine is rated at 22.5 horsepower by the S. A. E. formula and as the bore to stroke ratio is 1 to 1.40 it will be understood that the claim of 30 horsepower made for it is conservative. This is regarded as being ample for the hardest service that could be required of a wagon of 1500 pounds capacity. The motor is in every way simple and compact.

The four cylinders are cast en bloc from a fine quality of gray iron with the water jacket integral, the top of the water jacket being open so that it is possible by a special process to thoroughly clean the jacket, insuring against fins, core wire, core sand or any other obstruction, and having the spaces free for the circulation of the cooling liquid. The head of the block is a cast plate in which is incorporated the water outlet manifold and this outlet gradually rises at the rear of the block, a deep channel directing the movement of the water from the front of the motor to the manifold connection. This plate is retained to the block by a series of cap screws and a water tight joint is obtained by a gasket. The valves are at the left side of the motor.

After the cylinder block is bored it is aged, then reamed and ground to size and polished. It is admirably finished. The pistons are of the same material as the cylinder block and are carefully turned and ground to size. They are five inches length. The pistons are channelled for four diagonally split eccentric expansion rings, and these rings are ground on the edges and peripheries. In each piston are five grooves that collect the lubricant and insure lubrication. All of the pistons are carefully weighed and balanced.

The crankcase is constructed in two sections of a high grade nickel aluminum alloy and it is unusually strong. The upper half carries the main and the camshaft bearings, and the lower contains the oil reservoir and the means for distributing the lubricant. There is a large drain outlet in the bottom for the purpose of cleaning the oil container. The sections are extended forward beyond the web and these extensions, when closed with a plate, house the timing gears. The bottom section has a transverse horizontal web dividing it, and in this web are the four oil channels or pits into which the connecting rods sweep. The upper section has four arms cast integral at the front and rear which support the motor in the chassis frame. At the right side is the bracket that supports the water pump. There is a patented breather pipe that reduces the crankcase compression and minimizes the heat. This also serves for a filler for lubricant.

The crankshaft is a .35 to .45 carbon steel drop forging that has a tensile strength of 90,000 pounds to the square inch that is carefully hardened, heat treated and ground. It is 1.75 inches diameter and it is carried on three main bearings, the front bearing being 2.75 inches length, the centre three inches and the rear



The Left Side of the Motor of the Stewart Delivery Wagon Chassis.

four inches, this being a total of 9.75 inches of bearing surface. Both the shaft and the crankpin bearings are carefully ground to size. The shaft is flanged to take

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end thrust. The bearings are high grade nickel babbitt and after these are fitted they are extended on special extension arbors and are reamed and hand scraped. They are retained by brass retaining screws.

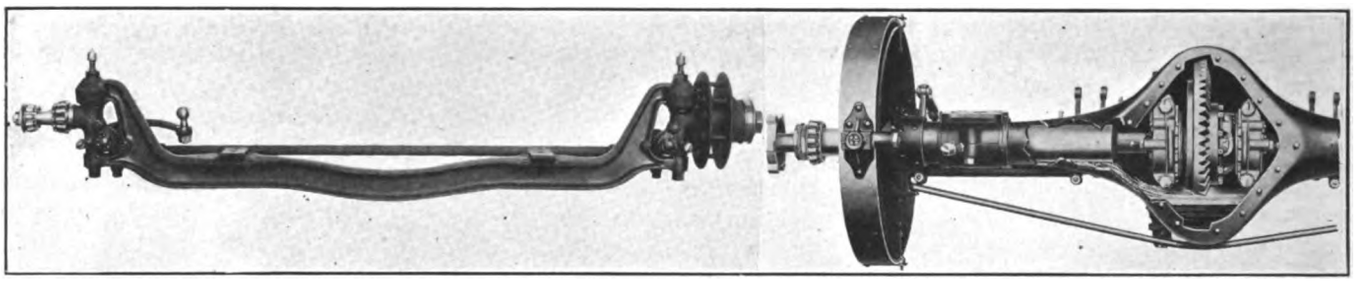
The connecting rods are I section steel drop forgings that are heat treated to secure full strength. They are 10.5 inches length and carry big end bearings 2.5 inches length. These are fitted with nickel babbitt bearings and the big end caps are retained by special nickel steel bolts that are retained by a locking device. Being fitted with sheet steel shims the bearings may be accurately adjusted for wear. These are fitted as are the main bearings. The wristpins are of liberal size and the bearings are of nickel babbitt. The camshaft is drop forged from a low carbon steel with the cams integral. It is carefully ground, hardened and heat treated. It is 1.0625 inches diameter and it is carried on three bearings, the front, middle and rear journals being 2.3125, 1.5 and 1.25 inches length, respectively, these being of nickel babbitt. The construction is such that it may be removed in a short time by taking off the gearcase cover at the front.

The timing gears are of large diameter and wide face and are helical cut to prevent noise. These include the crankshaft, camshaft, idler and pump shaft gears. The valves are large and have ample clearance to insure effective clearing of the exhaust, and to secure full charges of fuel. The valves are interchangeable and have nickel steel heads electrically welded to carbon steel stems. The valve seats, valves and the stems are accurately ground to size. The ends of the valve stems are hardened to minimize wear. The springs are large and well tempered. The valve tappets are of chrome nickel steel, of the mushroom type, case hardened, with heads and stems ground to size. There is an adjustment for wear. The valve mechanism is enclosed in compartments formed by side webs with cover plates retained by winged thumb nuts.

The intake manifold is integral with the block casting and there is a short riser by which the carburetor is connected. The exhaust manifold is a separate casting, and it is so formed that it does not in any way obstruct work on the valve mechanism.

The engine is lubricated by a pair of plunger pumps that are operated by an eccentric on the camshaft. The oil is pumped through a system of tubes to the rear main bearing and the timing gearcase, and the drainage is into the oil pits in the crankcase, where the oil is thoroughly distributed by splash. The excess is carried back to the reservoir and again circulated. The water is circulated by a large centrifugal pump driven by an outside shaft at the right side of the motor. The pump has unusually large bearings and the stuffing boxes are also of a size to insure long endurance. The radiator is of the flat tube type and is located at the dash on coiled springs, this preventing damage from road shock. Air is circulated through the radiator by a series of blades carried on the periphery of the flywheel. The ignition is by a high-tension magneto with fixed spark, this simplifying the system, minimizing the wiring leads and the connections, and insuring against any complication. Besides this, with the fixed spark there is little possibility of the motor being abused. The carburetor is an automatic float feed type that is maintained to afford a perfectly satisfactory mixture under all operating conditions.

The clutch is a multiple disc type in which 11 plates, nine inches diameter, are used, five of them being faced on either side with Raybestos and fitted between the other six discs. The clutch is positive and easy in engagement. It may be removed by taking off the front cover and the double universal joint between the flywheel and clutch. The clutch case is integral with the transmission gearset case and is a nickel aluminum alloy. The gearset is a selective type, a Brown-Lipe construction, and the gears and shafts are 3.5 per cent. nickel steel, double heat treated. The shafts are carried on Timken roller bearings throughout. There are three forward speeds and reverse. The shafts are fitted with stuffing boxes to prevent leakage of oil.



The Front and Rear Axle Construction of the Stewart Light Delivery Wagon.

The driving shaft is of high quality steel 1.25 inches diameter, and it is constructed with a universal joint at either end, to prevent possibility of misalignment. The rear axle is a Timken full floating construction, with a pressed steel housing shaped like the truss of a bridge. The housing is reinforced with sleeves at the outer ends, these sleeves supporting the spring seats and the weight of the machine on the wheels. The differential gears are large and are mounted on Timken roller bearings, while the wheels are fitted with similar bearings. The ratio of the differential is five to one.

The forward axle is a heavy I section with the pivots and the wheel spindles fitted with adjustable Timken roller bearings. The tail lever is a steel drop forging. The tiebar is located behind the axle for protection.

The frame is a high carbon steel channel section

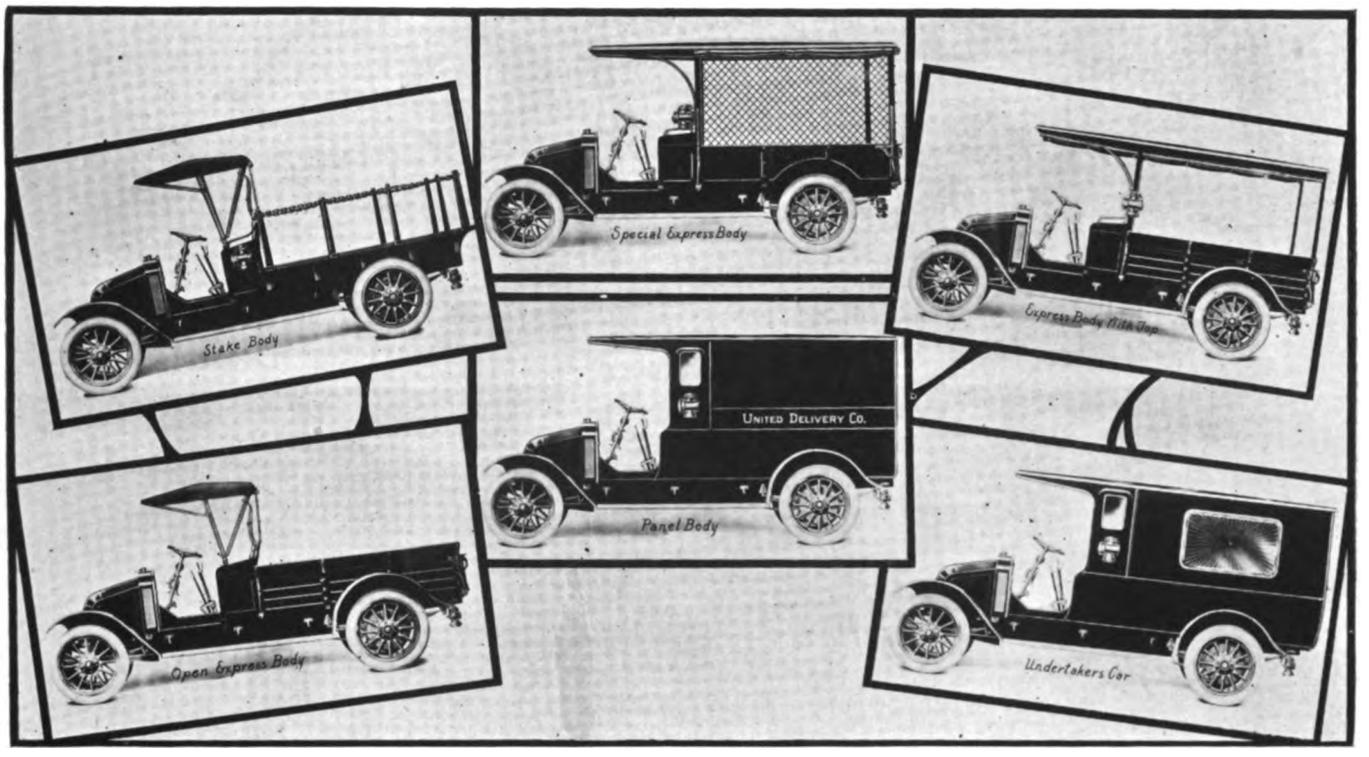
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that is 4.5 inches deep at the centre and tapered toward the ends. In this is mounted a sub-frame on which the motor is mounted. The front springs are 38 inches length and two inches width, of special analysis steel carefully heat treated. The rear springs are similar material, 50 inches length and 2.25 inches width. The wheelbase is 126 inches and the wheels are fitted with 12 spokes, 1.625 diameter front and 1.75 inches diameter rear. The tire equipment is 34 by four-inch forward and 34 by 4.5 at the rear.

The control is by the conventional pedal for the clutch and for the service brake, with throttle lever on the steering column above the wheel. The steering wheel is located at the left side. The steering gear is a worm gear type, with a worm of hardened steel, ground to size. The worm wheel is of hardened steel, integral with the shaft. Ample provision is made for adjustment for wear. The speed changing and the emergency levers are in the centre above the gearcase. There are two brakes, the service member being internal expanding and the emergency brake external contracting on drums on the rear wheels.

Unusual care has been taken to insure lubrication of every wearing part. All the spring bolts are fitted with large grease cups, the pedal and brake shafts have grease cups placed outside of the frame where they can be easily filled, and the steering gear is well lubricated.

The wagon is fitted with either express body, panel body, open box body with cape top, special express body with wire grating, a stake platform body and an undertaker's body. The usual equipment is furnished with any one of these bodies, and is complete in every respect.



The Six Types of Body Furnished as Standard Equipment with the Stewart Light Delivery Wagon.

MAIS COMPANY REORGANIZED.

Wheeler of Wheeler & Schebler Secures Controlling Interest in $1,000,000 Concern.

The property of the Mais Motor Truck Company, Indianapolis, Ind., maker of Mais trucks, which had been in the hands of a receiver since July 12, was purchased Aug. 19 by Frank H. Wheeler of Indianapolis, and Walter N. Pearce and H. G. Francis of Rushville, the purchase price being $71,000. In addition the new owners assume a mortgage of $10,000 on the plant.

Immediately after the approval of the sale by the court, the Mais Motor Truck Company was reorganized with capital of $1,000,000, the new officers being as follows: President, Frank H. Wheeler, who owns half of the stock; vice president, Walter M. Pearce; secretary and treasurer, Alvin S. Lockard, Indianapolis. Will H. Brown, formerly president of the company, is expected to remain as general manager. The other directors are Jacob V. Stimson of Huntingburg and Harry G. Francis.

FLANDERS TO ENTER FIELD.

Detroit Rumor Suggests the Production of a Worm Driven One-Ton Machine.

Coincident with a rumor that Walter E. Flanders, formerly president of the E-M-F Company, Detroit, and subsequently vice president and general manager of the E-M-F plants of the Studebaker Corporation, has resigned to devote his entire attention to the Everitt Motor Car Company, Detroit, and the Flanders

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Manufacturing Company, Pontiac, in both of which he is financially interested, comes the statement that he will soon enter the commercial vehicle field with a Flanders truck.

It is understood that the new model will be of one-ton capacity, and that it will embody several new features in design. The motor is to be a four-cylinder unit, and the particular feature will be the worm driven rear axle. This is to be offered in a number of differing body types to meet the various requirements of the purchasers.

APPOINTED SALES MANAGER.

Frank A. Groves to Be Held Responsible for Success of Speedwell Trucks.

Frank A. Groves, who is widely known in the automobile industry, has been appointed sales manager for the Speedwell Motor Car Company, Dayton, O., maker of Speedwell pleasure and commercial cars. This information will be received with pleasure by a large number of people who are personally acquainted with Mr. Groves, particularly in the Middle West.



Frank A. Groves, Sales Manager, Speedwell Motor Car Company.

Like a number of other successful men in the sales end of the industry, Mr. Groves is a graduate from the sales department of the National Cash Register Company of Dayton. After 14 years with that concern he found himself with the financial means to assume an interest in the Chicago agency for Speedwell cars. That was nearly five years ago, and since that time he has had direct charge of the sales of these vehicles in the Chicago territory. His present appointment therefore comes in the nature of a well deserved promotion.

ANOTHER THREE-WHEELED CAR.

Minute Man Tri-Car to Be Manufactured by Newly Organized Company in Middletown, N. Y.

The Industrial Motor Car Company, Middletown, N. Y., has been organized with capital of $350,000, for the manufacture of the three-wheeled commercial vehicle to be known as the Minute Man tri-car. The officers are: President, William G. Richardson; vice president, Waite M. Cotton; secretary and treasurer, Robert M. Bagg.

The plant formerly occupied by the National Saw Company, which recently removed to Newark, N. J., has been acquired, and alterations are now in progress. The car will have a two-cylinder opposed motor of 16 horsepower, two-speed planetary transmission, 86-inch wheelbase, and a variety of bodies to meet the individual requirements of the purchaser.

MARMON TRUCK ANNOUNCED.

Well Known Manufacturer of Pleasure Cars Adds Light Delivery Wagon to Its Line.

Coming somewhat in the nature of a surprise to the industry, the Nordyke & Marmon Company, Indianapolis, Ind., announces the production of a light delivery car with carrying capacity of 1200-1500 pounds. It is stated, however, that the concern has been engaged in experimental work for some time past, and that several of these machines have been used with satisfactory results about the Marmon plant for several months.

The motor is the same as that utilized in the 32 horsepower Marmon pleasure car, except that the bore has been reduced from 4.5 to four inches. Naturally, the entire assembly has been strengthened throughout. One or two new ideas in truck construction are evidenced, among them being the policy of fitting dual pneumatic tires to the rear wheels.

THREE-TON MODEL COMING.

Well Known Men Interested in Standard Company Now Being Organized in Detroit.

Howard Wilcox, for some time past connected with the Kelsey Wheel Company, and W. K. Ackerman, formerly assistant manager and purchasing agent for the Reliance Motor Truck Company of Owosso, Mich., are among those interested in the organization of a new commercial vehicle company in Detroit. This will be known as the Standard Motor Truck Company, which has been incorporated for $50,000.

A factory has been secured at 975 Bellevue avenue, and the work of production will be begun in the immediate future. The vehicle is to have a capacity of three tons, and will be of standard construction throughout. The motor will be a Continental.

SCHACHT WORM DRIVE MODEL.

Still Another Pleasure Car Maker Expected to Announce a One-Ton Truck Soon.

It appears that the Schacht Motor Car Company, Cincinnati, O., which has been engaged in the production of pleasure cars for a number of years, is soon to enter the commercial vehicle field, with a one-ton truck of distinctive design. It is stated that the concern has been engaged in experimental work for the past two years, and that the product is now about

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ready to be placed upon the market.

In many respects the construction of the new car is expected to follow standard practise, but a feature which seems to indicate a trend of the times, particularly as a number of makers have announced or are ready to announce the adoption of this type of drive, is the utilization of a worm driven rear axle. Another feature will be the use of pneumatic tires in front and solid in the rear.

NEW DEPARTURE BUSY.

Increased Demand for Its Product Makes Necessary the Erection of New Buildings.

As a result of recent tests made by some of the leading American car manufacturers, the factory of the New Departure Manufacturing Company, Bristol, Conn., maker of New Departure ball bearings, is one of the busiest places in the industry. All departments are working 127 hours a week and some of them 152, with night and day shifts of skilled mechanics.

It is stated by officials of the company that this remarkable condition is assured for weeks to come, the contracts for 1912 and 1913 delivery having been increased nearly three times over those for 1911. In order to take care of this increase in business additions to the factory have been planned, which when completed will give nearly 75,000 square feet of floor space. It is anticipated that this will be available late this fall.

JONES SPEEDOMETER EXPANDING.

Demand for Commercial Instruments Has Impelled the Addition to Its Plant.

To meet the greatly increased demand for its product, the Jones speedometer, recorder and hub odometer, the Jones Speedometer Company, New Rochelle, N. Y., has secured additional manufacturing facilities in the Bush Terminal, Brooklyn, N. Y., where the factory space will more than treble that occupied heretofore. The New Rochelle factory will be continued at its full capacity.

Oct. 1 the commercial vehicle instrument shipping department, now at Canal place, New York City, will be removed and consolidated with the speedometer service station in the Speedometer building, Broadway and 76th street. This will have the effect of still further increasing the shipping facilities of these instruments.

MIDSUMMER TRUCK SHOW.

Manufacturers to Have Opportunity to Express Themselves Regarding This Plan.

At the recent meeting of the executive board of the National Association of Automobile Manufacturers at the summer home of General Manager S. A. Miles, Christmas Cove, Me., the matter of holding a midsummer truck show in 1913 was discussed at some length. The sentiment of the meeting was about equally divided, and the secretary was instructed to secure the views of the various manufacturers concerning the proposition.

Albert Pope, chairman of the traffic committee, reported progress in the matter of freight rates and also on insurance of motor trucks. He announced that the Automobile Underwriters' Conference was considering the reclassification of rates on commercial cars, it having been developed to its satisfaction that the fire hazard is greater while the truck is on the road than while in the garage.

LATEST GRAMM DEVELOPMENTS.

Another Official Leaves for New Concern and Willys Brings Suit Alleging Fraud.

The recent purchase of the Gramm Motor Truck Company, Lima, O., by John N. Willys, president of the Willys-Overland Company, Toledo, O., has been followed by a general exodus of the old officials of that concern to join B. A. Gramm in the formation of the Gramm - Bernstein Company, and the latest developments would seem to indicate that the situation was far from being settled.



W. H. Moore, General Sales Manager, Gramm-Bernstein Company.

W. H. Moore, for some time manager of sales with the old company, has resigned to become general sales manager of the Gramm-Bernstein Company. He has grown up with the sales end of the motor truck industry and is regarded as a salesman of exceptional ability.

Early in the month John N. Willys brought an action against A. L. White and W. T. Agerter of the Gramm Motor Truck Company, asking for a cancellation of a contract involving the purchase of this concern and alleging fraud, in that the financial condition of the company was not as represented to him.

Correction of Error—In the August issue of MOTOR TRUCK, a cut of a G. V. electric, made by the General Vehicle Company, for the American Express Company, was used with a caption, indicating that it was produced by the Baker Motor Vehicle Company, which also has sold trucks to this concern.

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THE A B C OF MOTOR TRUCK IGNITION.

Part I--Outlining the Various Systems Utilized with the Commercial Gasoline Vehicle, Their Components and Application in Practise---Practical Definitions of Electricity, Types of Batteries, and Wiring to Obtain Maximum Efficiency.

By C. P. Shattuck.

THE ignition system is one of the most important factors in the economical operation of a gasoline commercial vehicle. The most efficient motor will not deliver its maximum power if the spark at the gap of the spark plug be weak, because a smaller amount of the mixture is burned than would be if the vapor were ignited properly. It is obvious, therefore, that considerable more fuel will be consumed, as well as oil, to obtain normal results. Aside from the increased cost of gasoline, due to using a larger quantity, a no small item in the year's expenses in these days of the high price of fuel, there is still another view of the situation.

Imperfect combustion lays the foundation for motor troubles, and consequently repair bills, increasing the cost of maintenance, and to keep operating expenses to a minimum the driver should familiarize himself with the components of the ignition system. This applies more particularly to the operator of the vehicle which is not equipped with a magneto, and it is surprising to note the large number of delivery cars which depend upon the battery and coil for ignition.

Reliability makes for efficiency as well as economy with the mechanical transport and if the driver does not possess a practical working knowledge of the ignition system, in the event of minor troubles the delivery of the merchandise will be delayed. Even with cars equipped with the magneto and employing the battery as an auxiliary source of current, it is important that the operator should understand the principles of electricity and their application to the internal combustion motor.

It is the intention of the writer to describe in non-technical manner the various ignition systems in vogue, outlining their components and operation, and presenting suggestions for installing modern equipment, as well as hints for locating and remedying troubles. The series will be supplemented with illustrations, these including charts and wiring diagrams, a study of which should enable the most inexperienced driver to obtain the maximum efficiency of the power plant.

Electrical Definitions.

Before taking up the various ignition systems in their logical order, the electrical terms will be defined to enable the reader to follow the practical rather than the theoretical effect in the discussions presented herein. No one knows exactly what electricity really is, but its relation to the internal combustion motor may be understood with a little study. It is largely utilized for lighting, heating and power, and in the last named form energizes a motor, while for lighting it heats the lamp filament to an incandescent state. It would not be practical to introduce a wire or filament into the combustion chamber of a gasoline motor for the purpose of igniting the explosive mixture and instead an electric spark is employed, it being produced by building up the initial or primary current and forcing it to jump across the gap of the spark plug at the desired instant, a system familiarly known as the jump spark.

The electricity employed in connection with the motor car is obtained from two sources, chemical or mechanical, the former consisting of dry cells or storage batteries and the latter a magneto or generator. The dry cell provides a certain amount of electicity and is favored because of its moderate price, although

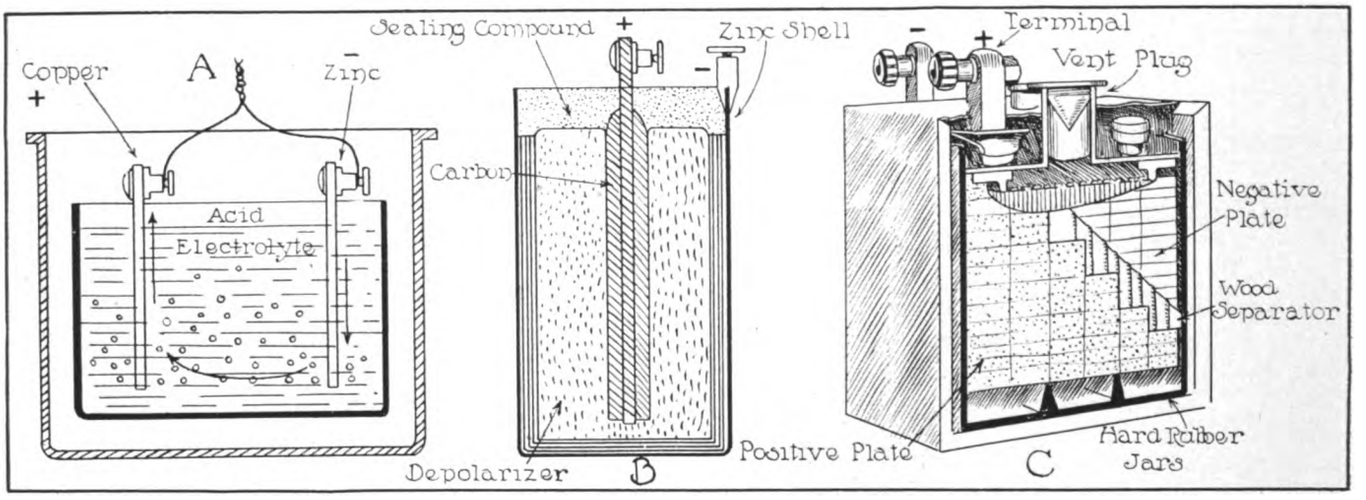


Fig. 1—Illustrating the Various Forms of Chemical Batteries: A, Simple Voltaic Couple, Usually Called Wet Battery; B, Conventional Type of Dry Cells; C, Lead Type of Storage Battery.

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when its energy becomes dissipated it is worthless. The storage battery differs from the dry cell in that its vitality may be renewed by passing a current

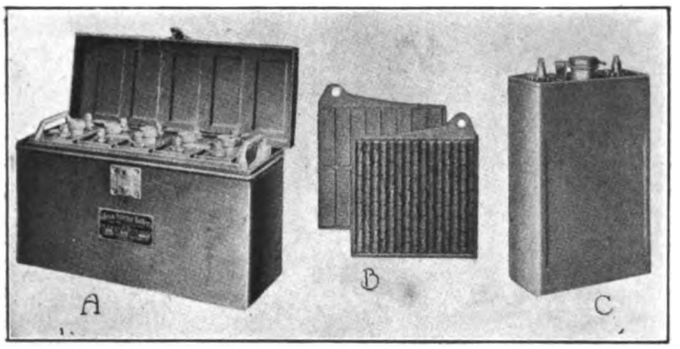


Fig. 2—The Edison Nickel-Iron Battery: A, B-4 Type Utilized for Ignition and Lighting; B, Depicting the Construction of the Negative and Positive Plates; C, the Cell.

through it, an operation known as charging. The magneto generates current mechanically when the motor is operating, but the production of electricity ceases with the impulses of the engine.

Chemical Battery.

Considering first the chemical cell: When two dissimilar substances or metals, such as zinc and copper or carbon and zinc, are immersed in an electrolyte, sulphuric acid and water for example, a chemical action takes place upon the zinc and an electrical current passes from the zinc to the copper, in the direction of the arrows as indicated at Fig. 1 A, which is a simple form of voltaic cell. It will be noted that the terminals or posts are connected by a wire forming the external circuit. Any combination of metals may be employed providing they are unlike, and any other salt or acid solution utilized as an electrolyte. The poles of a battery are known as positive + and negative —, and it is assumed that the current leaves the cell by the positive and re-enters by the negative. As the liquid battery is not practical for automobile use because loss of the electrolyte would ensue unless the cells were sealed, it will be dismissed from this discussion.

Flow of Electricity.

The flow of electricity is not generally understood; that is, the reason current will not flow from a battery until its terminals have been connected by a continuous wire or piece of metal. It should be explained first that current is the flowing of electricity and that the simplest analogy for a current is the flow of water, although there is little in common between the two, electricity being referred to as a fluid for convenience.

If two tanks of water at the same level, one being full and the other nearly empty, be connected by a pipe or tubing, the fluid from the full vessel would flow into the other until both contained equal amounts of water. Similarly, when two bodies are charged with unequal amounts of electricity and connected by a suitable conductor, electricity will flow from one to the other as illustrated by the wet battery at Fig. 1 A. The greater the difference between them the greater the tendency to return to the original level. This is termed difference of potential, and the terms high or low potential or electro-motive force indicate a large or small charge or condition at different parts. As with the tanks of water, the higher the full one is placed above the other the greater will be the force of flow of the fluid to the empty member.

Open and Closed Circuits.

A circuit may be either open or closed and may be changed from one to the other by the simple movement of a switch lever which performs the same function as would a shut-off valve incorporated in the piping between the two water tanks. By referring to Fig. 3 A the action of a current on a closed circuit will be noted, the arrows indicating the flow of electricity from the positive pole through the lamp and back to the cell by the negative terminal. The open circuit is illustrated at B, the drawing showing the switch open. The lamps as used in the sketches merely outline the flow of the current.

Electrical Units.

The units utilized to measure electricity are the ohm, the volt and the ampere. The ohm is the unit by which the resistance is judged. The volt is the unit of pressure, potential or electro-motive force, denoted by E. or E. M. F. The ampere is the unit of quantity or rate of flow. Referring again to the analogy between water and electricity, the ohm may be compared with the pipe connecting the two water tanks. If the tubing be large or small, long or short, rough or smooth, the water will flow correspondingly. In electricity the resistance increases directly as the length of the conductor or wire, the material, etc.

The volt is similar to the head or difference of level of the water in the tanks.

The pressure of the water in the full tank causes the fluid to seek an escape to the empty member. The

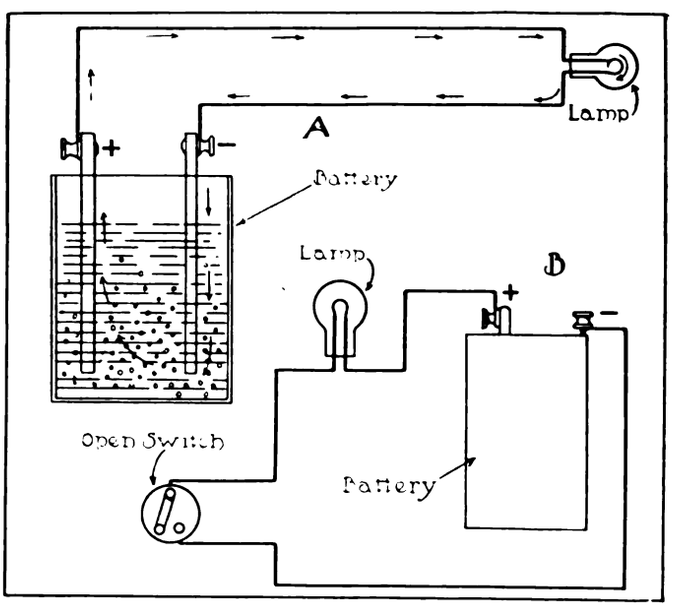


Fig. 3—Outlining the Flow of Electricity or Current: A, Showing a Closed Circuit; B, Break in Circuit by Introducing Open Switch.

volt is the cause of the current, not a part of it. It is the difference in voltage which causes a current to flow from one object to another. The volt may also be de-

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fined as that pressure or difference of potential which will maintain a current of one ampere in a conductor whose resistance is one ohm. Therefore one ampere is that current which one volt will maintain in a circuit the resistance of which is one ohm.

The watt is a unit of quantity, or amount of electric energy, and corresponds to a current of one ampere at a pressure of one volt. The term ampere-hour, utilized in connection with storage batteries, means that the member can maintain a current of one ampere for one hour. If the battery is a 60 ampere-hour member, theoretically it should supply a current of one ampere for 60 hours, two amperes for 30 hours, etc.

Construction of Dry Cell.

The dry cell comprises a shell of zinc, which not only serves as a container, but also acts as one of the elements of the cell. The cell is provided with a lining of blotting paper or similar material fitting closely against the inside of the zinc shell and serving to retain the sal ammoniac-chloride of zinc combination elec-

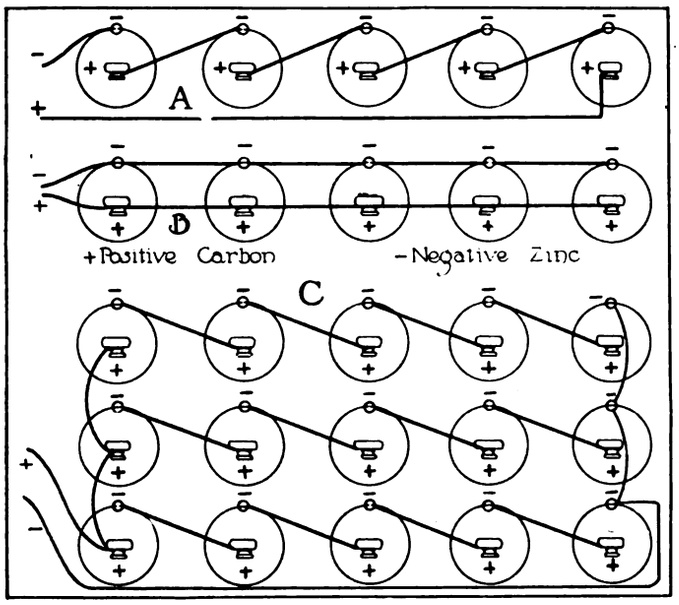


Fig. 4—Illustrating Methods of Wiring Dry Cells to Obtain Increased Voltage and Amperage: A, Series; B, Multiple or Parallel; C, Multiple Series.

trolyte. In the centre is placed a strip of carbon, as will be noted by referring to Fig. 1 B, and the space between the carbon element and the electrolyte saturated blotting paper is filled with carbon dust with which is mixed black oxide of manganese, which acts as a depolarizer, having as it does a great affinity for hydrogen. Over the top of the cell is poured a sealing compound to retain the moisture and hold the components in place.

It should be explained that polarization is not desired as it reduces materially the output of a cell. When zinc and carbon are placed in an acid bath and the outer ends or terminals are connected by a wire, the current produced in the wire by chemical action between the bath and the element of the lower potential, gradually becomes weaker and eventually disappears entirely. This is due to the fact that the free hydrogen, denoted by the bubbles in Fig. 1 A, is liberated from the bath, clings to the higher potential element and not only prevents proper contact with the electrolyte, but sets up a violent action with it. This effect is called polarization and to overcome it a chemical substance is added to the cell which will combine with the hydrogen as it is generated and prevent it from gathering on the positive pole, thereby reducing the output of the cell.

Referring again to the components of the dry cell: The filler of the zinc shell is packed tightly to diminish or lower the internal resistance. One of the reasons why dry cells of the same size vary so much in amperage is that the filling compound is packed in more tightly in some than it is in others. In some cells the utilization of certain substances which both mechanically and electrically tend to lower the internal resitance, increases the amperage output of the cell, and the life of the cell is cut down.

The filling compound, as a matter of fact, is moistened and being packed in tightly acts as a part of the carbon element, coming directly in contact with the blotting paper saturated with the electrolyte which, in turn, is in direct contact with the zinc. The paper lining serves to prevent the material from coming in contact with the zinc, thus creating a short circuit and ultimate deterioration of the cell. As a current is generated by the oxidization of the zinc element, which is eventually destroyed by chemical action, the elements of the cell are so arranged that all components deteriorate in the same proportion. The reason for making the zinc element the container and of such large proportions, is that a large surface is presented to the action of the current, increasing the volume of electricity. As the cell itself forms a portion of the circuit through which it must force a current, it is obvious that to obtain the maximum amperage or rate of flow, there must be the best possible contacts between its various parts. A cell of this type gives an electromotive force of 1.5 volts.

The Storage Battery.

The term storage battery is a misnomer, as it does not store electricity. Although it is thought by some to be similar to a vessel of water in which fluid may be drawn off as desired, such is not the case. As with the wet battery, with the circuit closed electricity is produced by chemical action.

At Fig. 1 C is depicted a storage battery of the lead type with the walls cut away to show its construction. It will be noted that the cell is composed of a number of plates in two sets, these being known as negative and positive elements, and that they are immersed in an electrolyte consisting of a solution of sulphuric acid and distilled water. The arrangement of the plates is such that the number of negative members exceeds those of the positive and they are grouped alternately with negatives on the outside.

The original or Plante type consisted of two plates of metallic lead immersed in a vessel containing sulphuric acid. An electric current was passed through the cell and the surface of the positive plate was con-

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verted into peroxide of lead, an operation called charging the battery. Plante and other authorities held that in charging, peroxide of lead is formed on the positive plate and spongy metallic lead on the negative, both being converted into lead oxide by the discharge. Others hold that sulphate of lead is made on both plates by discharging, and that during the charging, peroxide of lead is formed on the positive plate and metallic lead on the other, the sulphuric acid being set free.

In the Faure type, which is more commonly used, the active material in the form of lead oxide is pasted on and hardened, after which it is treated by an electrochemical process converting the paste on the positive member into a brown peroxide of lead and the negative into a gray, spongy lead.

A storage battery fully charged is practically a primary cell, as the plates in the electrolyte are a voltaic couple, such as the carbon and zinc in the dry cell. If the terminals of the storage battery are connected in a circuit, current will continue to flow through it until the elements are reduced to such a condition that there is no difference of potential. The application of the electric current in the process of charging, transforms the active material on the plates so that they become a voltaic couple again. The discharging and charging process may be continued indefinitely, depending upon the condition of the plates.

Arrangement of Components.

The plates are separated by strips of wood, chemically treated, or hard rubber, and these non-conductors are so constructed as to allow passage of the electrolyte to the plates, which are compactly arranged within a container of hard rubber. The tops of all the positive plates are connected by means of an acid proof lead bar which extends at one end of the cell through the cover at the top. The negative plates are similarly connected on the other side of the cell and provided with a terminal. Each cell is provided with a vent plug which permits the escape of the gas when the battery is being charged.

The voltage of a cell is fixed by the elements and the density of the acid employed, and is about two volts in the type utilized for ignition purposes. The amperage capacity of the cell, however, is dependent upon the size and number of plates and it is obvious that the greater the surface of active material exposed the larger the ampere-hour capacity. Cells are usually arranged in groups of three to obtain six volts, but the ampere-hour capacity may vary from 40 to 120. The charging, testing and care of storage batteries will be considered in logical sequence.

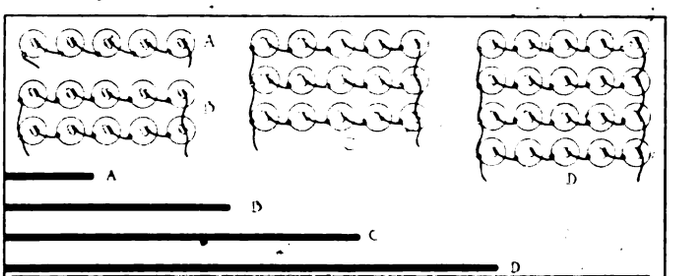
Edison Nickel Iron Battery.

A battery differing in construction from the lead type is the Edison, the components of which are illustrated at Fig. 2, and it will be noted that the plates shown at B differ from those previously described. The negative or iron oxide plate consists of a series of rectangular pockets in horizontal rows in a nickel plated grid. The pockets are formed of thin nickel plated steel perforated with fine holes. These are filled with iron oxide. The pockets are subjected to high pressure so that they are practically integral with the grid.

The positive or nickel hydroxide plate, consists of rows of tubes of about the size of a pencil held in vertical position by a steel supporting frame. The perforated tubes into which the active material is loaded are made of a high grade nickel steel. The tubes are formed with double lapped spiral seams and are reinforced by eight steel rings which prevent expansion as well as insure perfect contact.

In a cell the positive and negative plates are assembled alternately, the positive members being connected with the positive pole and the negatives with the negative pole. The plates of each group are suspended from a connecting rod integral with the pole. They are correctly distanced on this rod by nickel plated steel spacing washers, and are retained in contact by nuts screwed on at both ends. The separators are round rubber rods and the plates are prevented from coming in contact with the wall of the jar by strips of hard rubber.

The jar is of sheet steel and the walls are corru-



	ARRANGEMENT OF CELLS	Hours Service	Estimated Miles Service
A	1 set of 5 in series	30	400
B	2 sets of 5 in multiple series	70	1400
C	3 sets of 5 in multiple series	120	2400
D	4 sets of 5 in multiple series	170	3400

Fig. 5—Chart Showing the Comparative Life of Dry Cells Connected in Various Groups.

gated to afford strength. The cell is electro-plated and this plate is fused into the surface of the steel to prevent scaling. This plating protects the jar from oxidization. The electrolyte is a 21 per cent. solution of caustic potash and distilled water, and requires no other attention than occasional filling of the cells with pure distilled water. One of the qualities of the Edison cell is that it may be left for an indefinite period in either a charged or discharged condition without the slightest deterioration.

Wiring of Dry Cells.

It has been explained that the electro-motive force of each dry cell is 1.5 volts and as the average number of volts utilized to operate high-tension coils is six, the cells are wired together to obtain the desired voltage. The methods are known as series, multiple and multiple series and are depicted at Fig. 4 A, B and C, respectively.

When wired in series the carbon terminal of one cell is connected to the zinc post of the adjoining cell and the carbon of the latter connected to the zinc of the next battery and so on until the group is com-

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pleted. This leaves a zinc terminal of the first and the carbon post of the last free, and to each of these is attached a wire, forming the negative and positive poles of the group. When the two free ends of the wires are connected, a circuit is completed as illustrated at Fig. 3 A. The voltage of the five cells wired in series as at Fig. 4 A is five times 1.5, or 7.5 volts. The amperage of the group is not increased over that of a single member.

Multiple or Parallel.

The amperage or output of capacity of the same group of cells may be increased by wiring them in multiple or parallel as outlined at Fig. 4 B. Here the zinc terminals are wired together and the carbons connected. The total amperage or output will be five times that of a single cell. The voltage, however, is not increased over that of a single cell as the arrangement forms practically one cell with an increased amount of material in the elements.

Multiple Series.

When the cells are divided into equal groups, each being arranged in series and the groups connected in multiple to the outside circuit, the batteries are connected in multiple series. This increases the life of the cells, which is due to the fact that the amount of current used is drawn equally from each set, so that if four sets were employed the current drain on each would be only about one-fourth of the total. The multiple series of wiring is shown at C and here 15 cells are utilized. The voltage of the groups is equal to that of one cell multiplied by the number of cells in series while the ampere capacity is equal to that of one cell times the number of groups. Thus it will be seen that in series the voltage is increased, not amperage, while a multiple arrangement increases the output capacity.



Three-Ton G. M. C. Utilized as Produce Wagon in Detroit.

Service of Cells.

The economy effected by utilizing dry cells in multiple series is illustrated at Fig. 5, which depicts cells in series, also multiple series, and the comparative service of life by these arrangements is shown by the chart. The result of tests conducted by a leading dry cell maker is also given under the heading of arrangement of cells. In these tests the motor was equipped with a timer and coil and its average speed was 20 miles an hour. The service was continuous and the engine was not stopped until it began missing explosions. The hours of service and computed mileage are also given, and the economy of multiple series is apparent.

(To Be Continued.)

Ed. Note—The next installment will deal with the various instruments utilized in measuring electrical units, explaining their use, also outline differing forms of conductors.

G. M. C. IN MARKET GARDENING.

Replaces Seven Horses in Hauling Fruit and Vegetables in Wholesale Quantities.

The experience of H. J. Purse, engaged in the wholesale fruit and vegetable business in Detroit, with a three-ton G. M. C. truck, made by the General Motors Truck Company, Pontiac, Mich., has been such as to justify him in changing from horse drawn methods. The results not only indicate a decided saving in economy, but the ability to make speedy deliveries is a factor of some moment in this particular line.

An accompanying illustration shows the car loaded with 75 barrels of potatoes, lettuce and garden truck, which were all delivered to one man on the Eastern Market in Detroit. The weight of the load was about 4.5 tons. In addition to the produce raised in the vicinity of Detroit, berries, peaches, apples, etc., which come to that city from the South, are handled in the same manner.

The truck leaves the garage every morning between 1 and 1:30, and delivers several loads of fresh fruits and vegetables to the markets before 9:30. During the remainder of the day it is employed in making deliveries to grocers and markets all over the city. The daily service aggregates from 14 to 17 hours. Under the previous arrangement two double teams and three single-horse wagons were utilized in this same service.

MACKS IN LUMBER HAULAGE.

One of These Vehicles Does Practically 10 Times the Work of a Two-Horse Team.

The Western Lumber Company, San Diego, Cal., one of the largest operators in this class of service on the Pacific Coast, recently tested the efficiency of motor transportation as compared with its horse equipment for the delivery of lumber from San Diego to Miramar, a distance of about 20 miles. The lumber was utilized in the construction of a private residence costing approximately $150,000.

An accompanying illustration shows two Mack vehicles, made by the International Motors Company, at its works in Allentown, Penn., one being of five tons capacity and the other of seven. These vehicles were equipped with a derrick, which unfortunately is not shown in the picture, this being utilized for quick load-

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Mack Trucks of Five and Seven Tons Capacity, Engaged in Hauling Lumber on Pacific Coast.

ing and unloading, and by means of which it is stated that the entire load was placed on the vehicle in five minutes.

In another special work, one of these trucks hauled 40,000 feet of lumber in 10 hours from the docks a distance of two miles. The company states that the lumber arrived so fast that the entire force of men at its disposal was required in order to prevent a congestion of the material. The best that a two-horse team could do in the same time was three loads of about 1500 feet each.

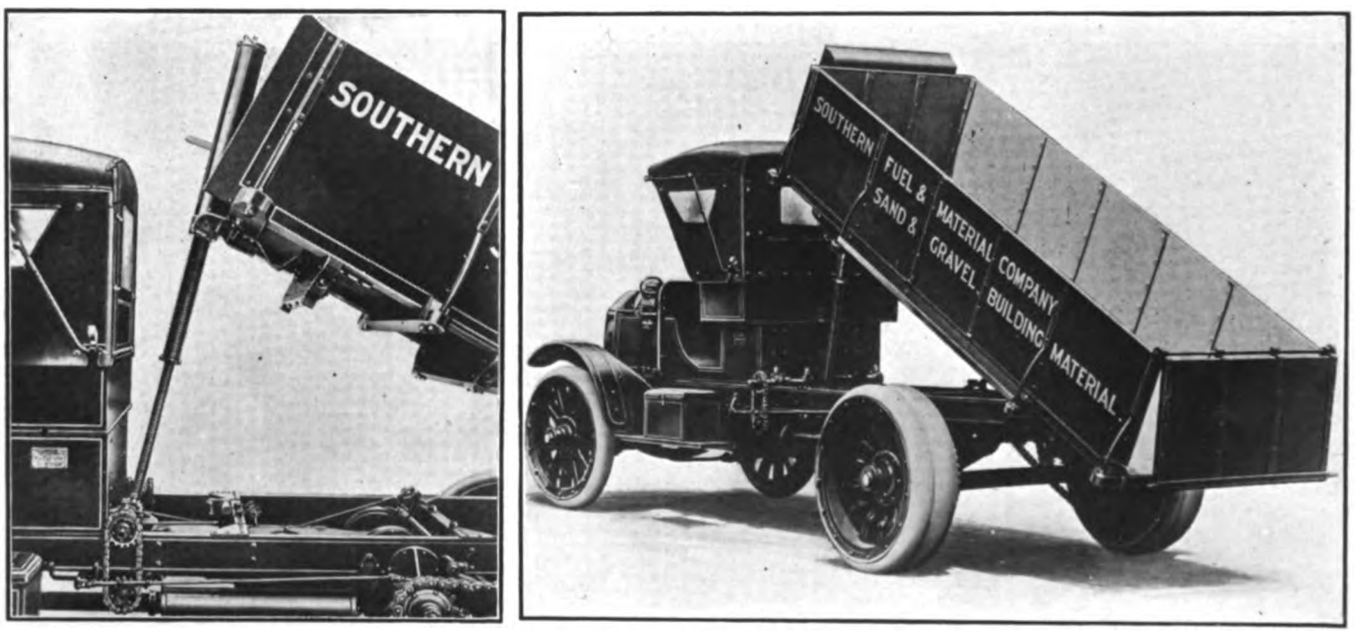
PEERLESS SELF-DUMPING BODY.

Alabama Fuel Dealer Does the Work of 12 Mules with Five-Ton Vehicle.

By the use of a new screw power hoist dumping body, designed by the Peerless Motor Car Company, Cleveland, O., the Southern Fuel & Material Company of Mobile, Ala., has accomplished the transportation of 150 tons every 24 hours with its five-ton Peerless truck. Night and day work are undertaken, the daily average being 100 miles. Twelve mules are being replaced in this work, the truck body carrying from five to six tons of gravel and in wagons formerly drawn by mules, which are now used as trailers, 25 tons more are handled. The average distance of the hauls is five miles.

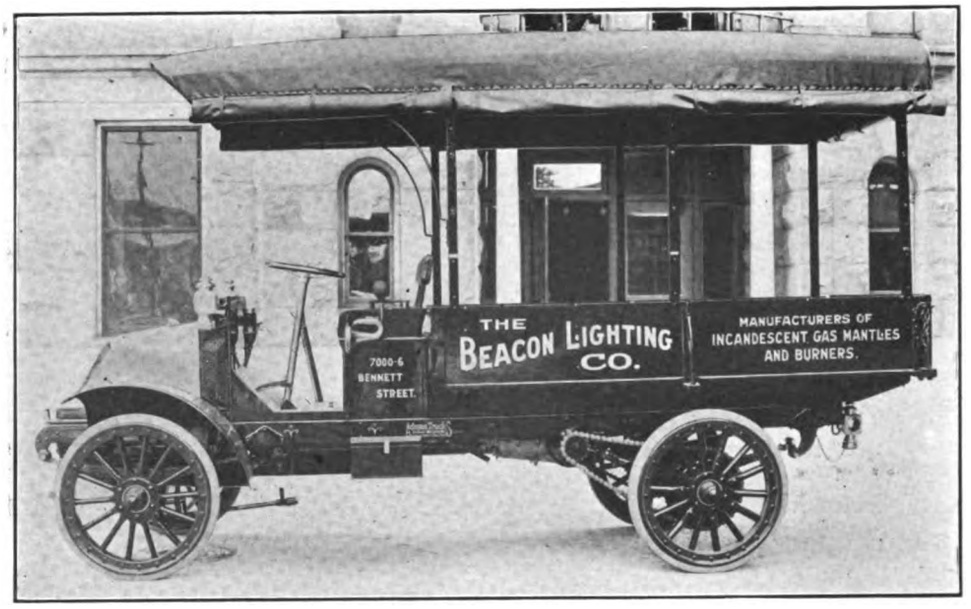
Accompanying illustrations show the hoisting mechanism, and suggest its method of operation. By this arrangement the load is dumped in 30 seconds. The truck is backed into position and the lever that unlatches the tail gate is tripped. Another lever turns the power of the truck motor into the dumping mechanism. The front end of the body rises rapidly, and the loose material finds its way out the rear end by gravity.

The power hoisting arrangement is such that the car may be started on its return at once. A touch upon the controlling lever causes the body to begin moving downward and it continues to descend while



New Screw Power Hoist Peerless Dumping Body, Which Is Replacing 12 Mules in Alabama—Hoisting Mechanism at the Left.

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One-Ton Adams Truck in Service with Beacon Lighting Company, Pittsburg, Penn.

the truck is in motion. When the body reaches its normal position the mechanism is disengaged automatically, and it is maintained that the entire process is accomplished without undue effort on the part of the driver.

ADAMS FOR LIGHTING SERVICE.

Special Attention Is Being Paid to Matter of Body Design for Varying Requirements.

Decided success has attended the introduction of the Adams one-ton trucks, made by the Adams Bros. Company, Findlay, O., which concern is well known in the business world, because of its long connection with engineering and manufacturing in various branches. Special attention is being paid to the matter of body design, and an accompanying illustration shows one of these trucks, equipped with a special body for the Beacon Lighting Company, Pittsburg, Penn.

The company has been engaged in the manufacture of machinery for the past 40 years. When it decided to enter the power wagon field the entire needs of the industry were studied with care, and the one-ton Adams is held to represent the best that its engineering force could produce. It will be noted that the chassis presents several special features, while the body in this instance has been designed to take care of the work to which it will be put in the most satisfactory manner. The car in question is said to have demonstrated its value in an economical and efficient manner.

ANOTHER WORM DRIVEN TRUCK.

Smith-Milwaukee Is Giving Satisfactory Proof That It Is a Successful Type.

While the Smith-Milwaukee three-ton worm driven truck was revealed during the commercial vehicle show in Chicago last February, little opportunity had been had to judge of its merits at that time. This should not be taken to mean that this product of the A. O. Smith Company, Milwaukee, Wis., had not been thoroughly tested under every condition of service, but, inasmuch as it had only recently been placed in the market, it was impossible to indicate what success it would demonstrate in the hands of purchasers. An accompanying illustration shows one of these cars in service with the Tews Lime & Cement Company of



Three-Ton Worm Driven Smith-Milwaukee in Service with Tews Lime & Cement Company, Milwaukee, Wis.

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that city, and it is stated that it has proven satisfactory from every viewpoint.

The Smith-Milwaukee product represents years of study and experimenting on the part of this manufacturer, which is recognized as one of the pioneers in the automobile business, having been engaged in the production of parts for a number of years. For the past 10 years it has devoted its entire time and attention to this work. Its present plant supplies 12 acres of floor space.

The chassis is designed on the unit assembly plan, and each of the more important units can be removed bodily from the truck without disturbing any other part and with the least possible loss of time. Two features of construction stand out prominently, these being the worm driven rear axle and the selective individual clutch transmission, in which the gears always are in mesh. The entire construction throughout makes for strength and simplicity.



Pierce-Arrow Five-Ton Worm Driven Truck Employed in Coal Delivery by Spaulding & Spaulding, Buffalo, N. Y.

PIERCE-ARROW COAL FIGURES.

Experience of Buffalo Concern Indicates Car Will Do the Work of Five Horses.

The demands upon the coal dealer for more prompt and cleaner service are growing more and more pronounced. Undoubtedly much of this is due to the fact that some dealers in each city have installed motor trucks. The possibilities of this method of transportation have been demonstrated and the high standard of deliveries, judging from a time basis, has come to be regarded as something to be expected generally. For this reason those who have not already adopted motor transportation have felt themselves somewhat handicapped.

The firm of Spaulding & Spaulding in Buffalo, N. Y., had felt the need of better equipment for some time and after making a careful survey of its requirements decided that in delivery matters an improvement could be made, providing the cost were not prohibitive. As has been true of a large number of dealers this concern found itself lacking in dependable figures with reference to the horse equipment, and for some time before purchasing Pierce-Arrow five-ton trucks, made by the Pierce-Arrow Motor Car Company of that city, began keeping accurate account of delivery costs, as well as complaints on service.

The first truck was placed in service about Sept. 1, 1911, and the figures to June 1, 1912, show that it actually handled 7916 tons of all grades of coal at a cost of 27.9 cents a ton, this figure including six per cent. interest on the investment, general insurance of necessary kinds, the wages of one driver and a helper, tire expense, gasoline, lubricants, repairs and a fair annual allowance for overhauling, as well as an ample margin for depreciation. It was found that in tonnage, the truck did the work of two two-horse teams and one single, reducing the cost by 20 cents a ton.

Within the same period, 8093 miles were covered. In the matter of tire service, it was found that the allowance for this was far below the actual results, it being estimated June 1, that the tires were still capable of at least 1000 miles. That the installation was in every way satisfactory, is borne out by the fact that the Pierce-Arrow Motor Car Company delivered its second five-ton worm driven truck to this concern June 1.

P. D. Schenck, president of the Speedwell Motor Car Company, Dayton, O., has assumed the responsibilities of general manager as well.

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The MOTOR TRUCK
Devoted to Motor Driven Business Vehicles of All Classes.

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PROBLEM OF EFFICIENCY.

The importance of the motor truck in solving the transportation problem is only just beginning to be realized. That it is an economic factor in the haulage of goods has been proven. It only remains to secure the utmost efficiency from the vehicle, which is recognized as possessing mechanical efficiency in every respect.

This problem of efficiency is somewhat new. When economists discovered ways and means of laying many more bricks in a given time by arranging matters so that the masons could handle them much more rapidly, the masons were by no means enthusiastic at first. It was only when they were made to appreciate that by laying more bricks they were worth more to their employer that they were willing to co-operate in carrying out the new scheme.

The spirit of co-operation is equally necessary in bringing about the utmost efficiency which may be expected from the mechanical transport. Building contractors may assist by so placing their concrete mixers, for instance, that they may be accessible to the trucks. Retailers could assist by so arranging their receiving space that the wholesaler could make the quickest possible delivery. The list might be increased indefinitely, and with each the resulting economy to the party of the second part is quite as marked as to the car owner.

SEEKING MOTOR TRUCK DATA.

That there is a well defined movement in favor of the more general adoption of the motor vehicle for commercial purposes is borne out by the fact that trade organizations are seeking opportunity to collect data which will be of service to their members in making selection of the proper car for their needs. This applies particularly to national bodies, although there is at present a tendency on the part of local boards of trade to take up this matter in a systematic manner.

Fire department heads have been giving the subject attention for some time, and the major portion of their annual convention programmes is devoted to discussions of results obtained in various sections. Within a few months the undertakers, laundry proprietors and others have taken up the subject in a similar way. It would appear that there is to be generous demand for carefully collected and readily assimilated information of this character.

THE ARMY MANOEUVRES.

That the United States government has decided to continue its experimentation with mechanical transports in connection with the annual militia manoeuvres is strictly in keeping with the stand which has been taken abroad. The War Department has been criticised freely because of its seeming lack of enthusiasm regarding the subject, and on the face of things France, Germany, Austria and other foreign nations appear to have progressed much further along these lines.

When it is remembered that trucks of American manufacture have competed successfully with the best of foreign productions in war trials which have been conducted abroad, it would appear the home government had little to lose in encouraging production along these lines. British motorists take extreme pleasure in pointing out that road conditions are by no means ideal in America, but it hardly will be denied that they compare favorably with those over which some of the recent European trials have been conducted, and in which the product of the United States showed up so well.

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ELECTRIC TRUCKS IN MILL SERVICE.

Pacific Mills, Lawrence, Mass., in Haulage Largely Yard Transfer, with an Admirable System, Saves About 20 Per Cent. of the Cost of Similar Work with Animal Vehicles.

By William W. Scott.

EVERY investigation of the cost of highway transportation has demonstrated the seemingly utter indifference of business men to the possibilities of economies in haulage. There can be no other reason for this than the fact that existing conditions have been regarded as quite beyond the control of any person or persons. It would appear that custom had been followed generally and with rare exceptions nothing was or is known of the expense of service, even with equipment of large proportions.

It will not be maintained that failure to systematically account the cost of vehicular transporting is due to lack of knowledge of the value of accounting. It will not be assumed that expenditure for haulage is absolutely inconsequential, but because such expense must receive at least casual attention, it is reasonable to conclude that there is no consideration of whatever cost conditions may appear to require.

In striking contrast with this policy is the very general desire to limit and restrain the charges of the public service corporations, it being maintained that trade and commerce may be seriously affected, and even controlled, by such organizations. This is instanced to establish beyond question that the transportation cost has been considered when exact figures were known. These, however, came to the shipper from the carrier and issue taken concerning them has been invariably by the former, to endeavor to bring about modifications and changes of prices fixed by the latter.

No one will deny that the cost of transportation, no matter what the character, is increasing from year to year. This has been in greater ratio with highway conveyances than with other forms of transports because the neglect to economize, while with public service corporations endeavor has been made to minimize expense wherever possible. It may be said that the best examples of system and organization are the railroad and steamship companies, which have been developed with long experience and are directed by men of undoubted ability, whose success has been achieved in competition with the acknowledged experts of the nation, if not of the world.

It may be said that these concerns expend large sums improving their facilities and equipment because the one purpose is to carry greater loads for the same cost or the same loads for lessened expense, and to save the time of the men and to reduce the maintenance charges. Efficiency of service is sought from every point of view. All factors are considered. But it must be understood that these do not deal with highway conditions save in the case of express delivery, and usually under the most favorable circumstances for work. It is only by accurate knowledge of expense that such enterprises can be made profitable, and the more detailed the information the more certain and dependable are the conclusions.

It has been agreed that the most profitable form of transportation is the long haul, and the least productive the short haul, and this has been the experience with so many that the exception is occasion for surprise. But as few enterprises can select the most profitable and avoid the most unprofitable and all busi-



The Fleet of Five General Vehicle Machines Leaving the Garage of the Pacific Mills, Lawrence, Mass., for the Day's Work.

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ness demands must be given a reasonable degree of attention, the service must necessarily be as required by the conditions in which it is maintained. Within the last decade the radius of highway haulage has increased materially, and it is probable that it will continue to increase until the limitations of the business have been reached, but no one will today attempt to define where the line of demarcation can be established with reference to any specific subject. It will, no doubt, eventually be practical to make exceedingly close estimate and to differentiate which form of transportation is best adapted to meet stated requirements, but this will not be possible until absolutely accurate data have been obtained and carefully arranged.

While the radius of haulage has been increased, generally speaking, there has been even larger growth of volume of shorter hauls, and where traffic has become in any way congested speed is limited to the average of the movement unless special provision has been made to systematize the use of the streets. This is done in many cities and the result has been very gratifying, but such regulation does not expedite haulage for but a very small part of the haul.

In the use of motor vehicles there is an opinion prevailing that these are best adapted for long hauls because of the superior speed, and that when the stops are frequent and the trips of comparatively short distance there is so small a margin when contrasted with animals that it is not profitable to utilize them. This conclusion appears to be based on experience with all forms of conveyances, and it is honestly shared by those who have worked both animal and motor wagons and have been satisfied with their decision. There are those who will analyze a condition from their experiences, and point to what appears to be sound business logic to justify their suppositions. In fact, it is clear enough to these men that they have utilized their vehicles with careful judgment, and the results are regarded as being quite as good as any person could accomplish under similar conditions.

It has been maintained that in the utilization of motor vehicles the one handicap was the continuance of methods the vogue with animals, and the measuring of service by animals. It has been established quite conclusively that horse cost has been fixed much in excess of what it ought to be, and that the neglect to adopt means for using the motor wagons that would insure the largest measure of return has lessened the margin of economy materially. That is to say, that many men have taken the market price for renting horses and carts, which assumedly carried a reasonable profit to the owners, and placed against this the reduced earning capacity of their motor vehicles.



The Electric Wagons and Trucks Awaiting Orders After Reporting to the Office of the "Dispatcher," Who Directs the Service.

One of the most interesting examples of the use of motor wagons in short haul service is afforded by the Pacific Mills, Lawrence, Mass., a manufacturing corporation that employs in excess of 6000 persons and has a number of plants. The company manufactures cotton and worsted textiles, has a large bleachery and dyehouse, and a print works that will be, if plans fructify, the largest establishment of the kind in the world. This concern has practically eliminated animals from its service. In fact but one horse is now worked and this is kept busy in the yards at a constantly changing service. It might be possible to eliminate this without the change being noted.

The mills are located at either side of the Merrimac river, and are so situated with reference to the railroad that all the shipments of raw materials and supplies, as well as the manufactured products, are received and

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The Two 3.5-Ton General Vehicle Trucks, the Largest of the Regular Service Machines, in the Garage Yard.

sent out on spur tracks that enter the mill yard and are with terminals at the different storehouses. It will be seen from this that all the haulage that might be expected under less advantageous conditions is eliminated. Not all manufacturing plants have such facilities, and no doubt this results in a large saving each year.

As might be assumed the corporation has been long established and it has been successful. What has been accomplished has been largely resultant of organization and system, and by the utilization of every economy that was practical. Its management is conservative and whatever is undertaken is with careful consideration of all the possibilities and in accordance with well matured plans. Up to 3.5 years ago all of the haulage was with animals and wagons. Now the company has a service department of considerable proportions and an admirably equipped garage, and all of its work is done with motor vehicles. All of its work is short hauls. This is exactly the class of transportation that the users of horses say is best adapted to them and in which the truck is least profitable.

The statement is made that the saving with the power wagons will approximate 20 per cent., which is much larger than what would be considered necessary to justify a transition of the service, and this economy has been realized without sacrifice of any kind. To the contrary there has been an expansion that has been in every way satisfactory. It is not maintained that the fullest results have been attained, but what has been accomplished has demonstrated the wisdom of the change.

About the opening of 1909 the Pacific Mills had a stable containing 15 horses and the animals were worked singly and in teams about the yard. The work was not in haulage to shipping terminals because of the railroad facilities, but it was necessary to have them hauling between the different departments. Perhaps it might be well to outline the service. The purchasing department of the mills has supervision of the stables, storage and the transporting. Every purchase is made by this department and it maintained at convenient locations in the mill yard storehouses in which were stored all of the supplies necessary in the different mills. To illustrate, these supplies may be machinery, machinery parts, belting, oil, grease, paint,

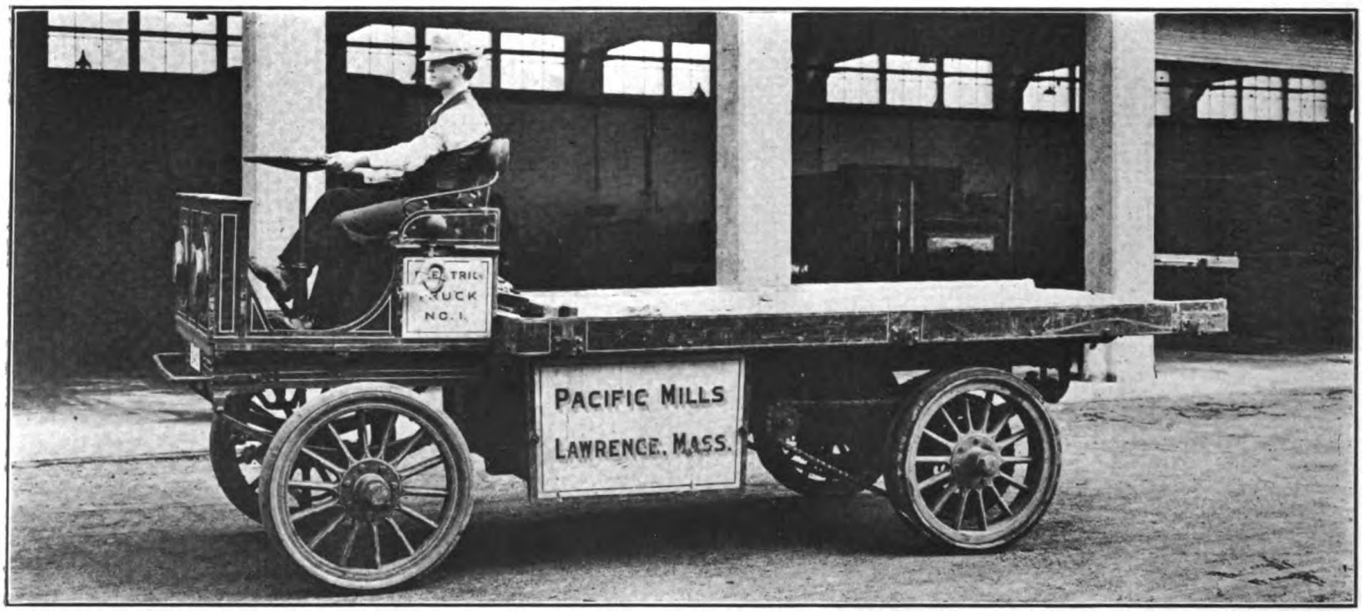


The Two Two-Ton General Vehicle Wagons Used for More Rapid Work in the Pacific Mills Regular Haulage.

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glass, brooms, shovels, tools of all kinds, pipe, pipe fittings, plumbing supplies, different dyeing and bleaching materials, and the thousand and one articles used in maintenance and operating as well as manufacturing.

It would not be practical to place these supplies in a common warehouse, or in each mill building, to be drawn upon indiscriminately. Economy has impelled that many of the purchases be made in large quantities and stored until required, when they can be distributed as required upon requisitions that will account for everything, as in an establishment of this kind manufacturing cost is computed to the thousandth of a cent, and a very slight percentage of loss would in the aggregate be a large sum. It might be well to emphasize that it is the saving of the small items that brings real economy, and as may be assumed the system of the Pacific Mills was the result of years of experience and thorough knowledge of every possibility.



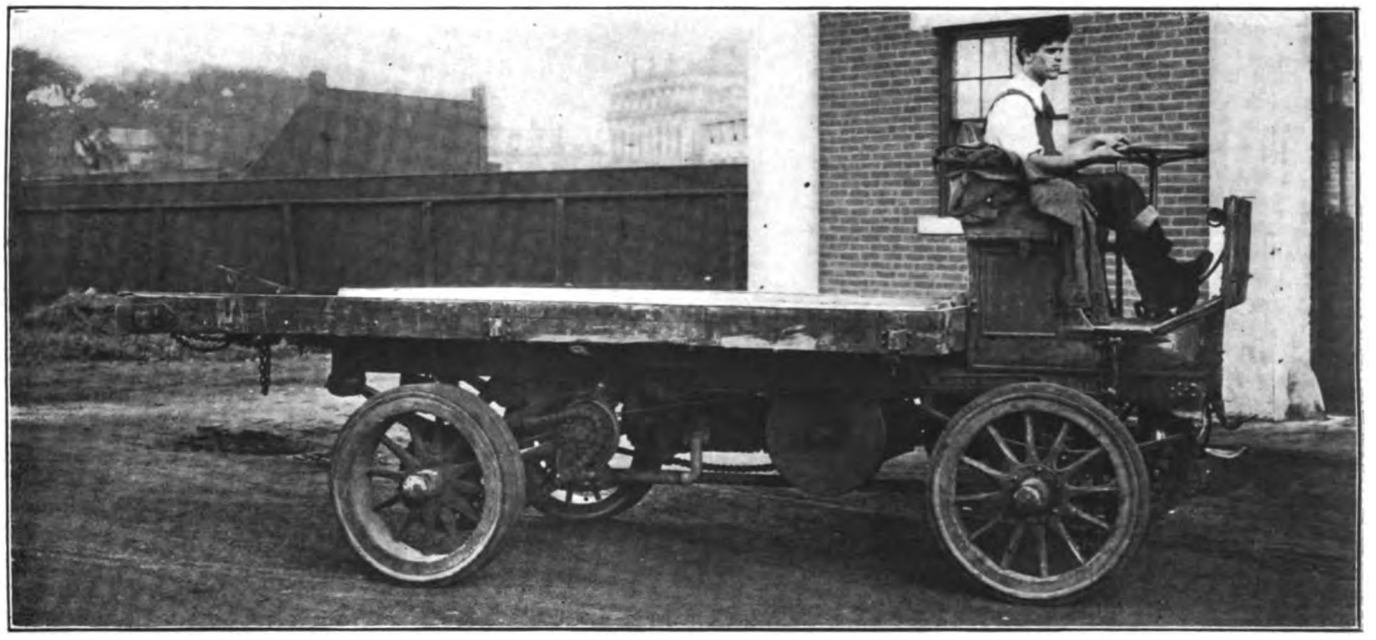
The One-Ton General Vehicle Wagon, Without Cover, to Take Care of Bulky Loads Not Practical for the Enclosed Machines.

The horse service had been organized with realization of the capacities of the animals and the work that could be expected of them each day. A very accurate account was kept of the expense of operating, but it was not practical to give the exact cost of each animal because of the physical difference in them, so far as food requirements were concerned, which was reflected to some extent in the cost. In other words, some horses cost more to keep and use than others, and some animals were capable of more work than others. The actual expense of maintaining the service, however, was known, and it was averaged to the animals, which was believed to be a sufficient accounting as to cost. In connection with this it might be pointed out that there were some charges that were fixed for a year, such as veterinary attention, and there were the other constant or overhead expenses. It was not practical to keep the exact work of each horse, but the total volume of work was recorded and so for any given period it was possible to learn the exact cost of operating and the approximate work of each animal. From this it will be understood that the company in its teaming followed its system of detailed accounting and had precise knowledge of expense and work. In this respect it differed from the great majority that include haulage and delivery in one or more items in general operating expense.

The experience of the company was that horses could do about a specified work each day as an average. In extremely hot weather it was necessary to favor them. In winter the horses could not haul as much when the streets were rough and snow a partial obstruction. There was perhaps seven months of the year when the theoretical efficiency was realized. When it was necessary to work the horses overtime it was found imperative to give them relief or rest, and this meant hiring animals temporarily or having a sufficient number of extra horses to meet such exigencies as might arise. It was found, as thousands of others have experienced, that there was a limit to the capacity of the horse for work, and there was no reserve that could be utilized to advantage. By this is meant that there was no reserve if it was desired to obtain the fullest service of the animals, to conserve them with a view of realizing their constant capacity for the longest period possible.

In analyzing the service required by the mills it should be said that it was well organized. According to the requirements the work was systematized and each driver had specified routes to cover, driving back and forth between the storehouses and the various departments, handling the freights as quickly and judiciously as was possible. Loading and unloading occupied a comparatively larger proportion of the entire time, because the hauls did not average more than 2000 feet, and while in some instances assistance was given the driver and helper on each team, as a rule they were

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Knox Two-Ton Platform Truck, the Type of Vehicle with Which the Experimental Haulage of the Pacific Mills Was Made.

expected to handle the freight without help. One work was street watering in a section where the company's tenements were occupied by its employees, and this varied according to the weather conditions. Aside from this, however, there was what might be regarded as a constant service, with occasional demands for haulage that was of necessity performed at night.

The winter conditions at Lawrence are by no means extreme, but there are heavy falls of snow at times, and it is not uncommon to have highway traffic more or less impeded for a considerable length of time. It is expected that during such periods the capacity of the animal vehicles will be materially reduced.

The company had statistics showing accurately the cost of transportation by animal vehicle. It was then, and no doubt is now, entirely practical to obtain figures for any specified length of time relating to the entire service and to apply these as a unit, so that the cost a ton-mile could be established without doubt. It may be that these figures would show what would be a higher cost a ton-mile than might be realized with a longer average haul, but from the viewpoint of the company what could be obtained under other conditions or circumstances was not material. Its requirements were known and the one purpose was economy with its service, and such saving was possible only by the reduction of the ton-mile cost.

The value of properly accounting the operating and maintenance cost of a haulage service could not be better illustrated than with this experience. These figures established facts that are ordinarily guessed or estimated, and which were the only dependable foundation on which to judge transportation efficiency. So it can be said that the Pacific Mills problem has been



Three-Ton Knox Truck, the Largest Vehicle of This Type in the Service, Utilized for Bulky Freights as a Rule.

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worked out in an ideal manner. Nothing was uncertain and every available channel for saving was understood.

The company decided to experiment with power wagons and purchased a second hand Knox machine, placing it in service with its horses. It was realized that a used power truck was not as economical from any point of view as a new vehicle, but experience was desired. The work was begun in the winter, when the conditions are most severe. The truck was worked under every condition in which it was believed tests should be made, and for a sufficient length of time to establish whatever facts were desired. Naturally, careful record of service and expense was kept, and with reasonable allowance it was found the truck was economical. By this is meant that the use of the truck by its previous owners, the somewhat larger expense for maintenance, the lack of experience, the possibilities of greater economy with more complete facilities for garaging and repairing the machine, the purchase of supplies in quantities, and other factors were considered, and while it was understood that the relative values depended materially upon administration there was no question that in the aggregate they would amount to considerable.

It was found that the truck was as efficient at the end of the day as at the morning, that it could be worked overtime with no diminution of capacity, that it could be depended upon for capacity work winter or summer unless in the event of a very severe snow storm, that it could be worked continuously with merely a change of drivers, that it required no more systematic care and attention than any other machinery, and that were it not in use the cost of idleness was limited to the fixed charges. Comparing the record with the cost of similar service with horses it was found there was a saving, to say nothing of the reserve capacity, and after a period of careful observation and experiment the company purchased a second used Knox truck and continued the demonstration on a larger scale.

In observing the work of the truck a purpose was to determine what would be the most satisfactory system of utilizing them. Horse methods, if they could be continued, could only be expected to yield the more service through increased speed and larger capacity, and it was realized that overloading and excessive speed would result in deterioration. Economy of time in loading and unloading could be applied to horses just as well as to mechanical vehicles, so there were limitations as to the possibilities with the new forms of conveyance.

The experimental work covered a period of approximately a year and then plans for a complete transition of the service were determined and developed. These included the construction of a garage that has a capacity of 20 machines. This building is a single story, of sufficient height to permit sheltering any power vehicle that can be used, with different bays so that the vehicles may be backed into them and with sufficient space about the machines that they may be cleaned, examined or repaired. The structure is brick and concrete and it is practically fireproof.

The garage is designed with a floor area that will allow 14 vehicles to stand side by side in the seven bays, with space between them and the entrances that will accommodate six and possibly seven others. There is a series of windows at either side of the walls, high above the floor, permitting good light. Instead of one or two entrances, requiring considerable floor space for shifting when entering or leaving the building, eight wide doors require practically all of the front of the ga-

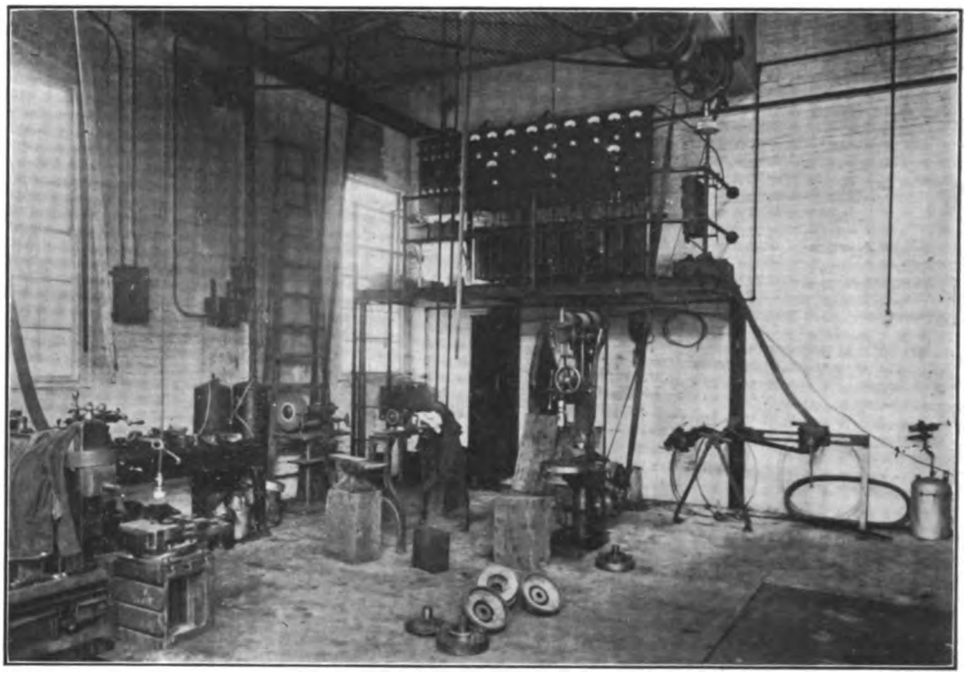


International Harvester 1500-Pound Wagon, One of a Pair of Machines Used for Errands and Emergency Calls, Besides Regular Route Work.

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rage below the windows. These doors are separated by large concrete posts or columns which support the side wall and roof. The doors are of the steel curtain type, that are raised or lowered and are so balanced that they may be opened any height desired and left perfectly secured. This design permits the use of the entire floor and the shifting and turning is done out of the building, where there is little, if any, probability of accident. At the street end of the building is the office, a small apartment where the drivers may make out their reports, where they present themselves each morning before leaving, and where a watchman is on duty day and night. At the other end of the building, occupying the space taken by one of the sections or bays, is the repair shop, into which a truck can be run, with abundant area for work. This shop is equipped with such machine tools as are necessary for work on the vehicles, ample bench space and hand tools for the repair man, and with chain hoists and other facilities for handling heavy weights. The power is supplied by an electric motor, the current being furnished from an adjacent power plant.

On the side wall, high above the floor and out of the way, is a balcony, and on this is located the charging panel of the garage, which is designed to charge 12 electric machines at one time. This installation is in every way complete and is probably an ideal in that it is impossible for an accident through ignorance of the dangers from contact with the panel and wiring. It cannot be reached save by a ladder and it is under the observation of the mechanic in charge of the work during the time the shop is open. At other times only the electrician who supervises the charging of the electric vehicles has access to the panel.



A Section of the Repair Shop of the Pacific Mills Garage, Showing the Charging Panel on the Balcony, and Some of the Machine Tool Equipment.

In each of the six bays or spaces of the garage floor are two charging plugs or receptacles, so that any of the electric machines may be charged when desired. The current is available at all times. It is not necessary to shift the electric trucks to any particular place or confine them to any section of the garage. The mechanical work at the garage is in charge of a single machinist, who can have what help is necessary should a job require, and he has the resources of the mill machine shops for such machine tool work he cannot do with the garage equipment. Of course parts and material for practically every emergency are carried. When work is necessary the main object is to complete it as rapidly as is possible that the service may not be lessened.

In the experimental trials gasoline wagons were used exclusively, and it was natural enough that when the regular installation was decided on and the horse service was to be gradually reduced this type of vehicle was first employed. The transition was brought about as circumstances permitted and as the wagons were acquired the horses were dispensed with. During the 3.5 years since the trucks were first used the company had built three large mills and work is now progressing that will make the print works the largest enterprise of the kind in the world. Reference is made to these facts because the haulage is made by five General Vehicle wagons, three of 4000 pounds and two of 7000 pounds; by five Knox wagons, four 4000 pounds and one 6000 pounds; one White 10,000-pound truck, and two International Harvester light wagons. This is a total of 13, and to state that this number of machines had been substituted for 15 horses would by no means represent facts, for it is probable the work had been increased three times as compared with what was required 3.5 years ago. At least there is work enough to keep them all busy, and the prospects are that more will be added, as the mammoth print works will probably add to the requirements considerably.

The methods the vogue at the Pacific Mills are such as to impel the admiration of the investigator of vehicle haulage. Based on practical experience and directed with care it is evident to any observer why they have been productive of economies. It is a common sense system and it is as simple as it is efficient. First of all the garage foreman or mechanic is responsible for the condition of the vehicles. He is expected to have them ready for service each morning, unless it is impracticable or impossible to work them. When the drivers report to the garage the wagons are ready for them to start.

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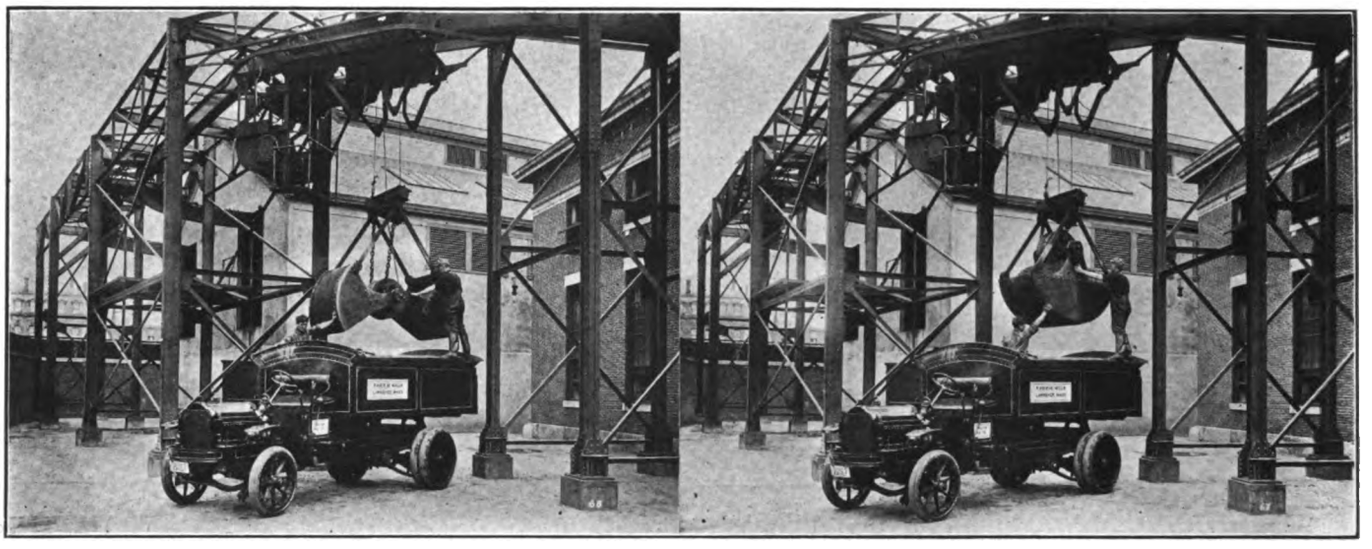
The work is then directed by the "dispatcher," who occupies precisely the same relation to the service that a train dispatcher does in steam railroad operation. There is in the dispatcher's office a sheet on which is printed the name of the 35 different regular places of delivery from the storehouses in the order of outward and inward trips, and columns for each vehicle doing this distribution. One column covers each trip. This same sheet covers the work that may be done by practically all of the machines in regular assignments, and to it is added any record that may be necessary to account for special work.

Taking a truck as an example: All drivers leave the garage when instructed to do so by the dispatcher, who telephones the garage office when the drivers have reported to their vehicles, and immediately each man takes his machine out for the work assigned for him. The time of reporting is noted by the dispatcher and from the time the machines leave the garage they are absolutely under his direction. No work can be done except by his instruction and each man has a schedule to work to. If the truck should be distributing the time is noted when it should be at each station on the outward or inward trip. From all mill departments orders for haulage are telephoned the dispatcher, who can state when the vehicle will arrive and will know whether or not the order can be filled by regular work. If necessary he can assign a special truck for the job. While a truck may stop at all of the 35 stations, it may not be necessary to take off or put on freight at more than two or three during a trip, but each driver telephones the dispatcher from specified stations and receives whatever orders may have been accumulated after the start was made. So it will be seen that the service is scheduled as are trains.

If the driver does not reach the stations on time, or he is delayed, he must explain his delay, and immediately the responsibility for the retardation of the service is sought. No matter whom or what the cause emphasis is made that a repetition cannot be tolerated and that receipt from and delivery to the trucks must be expedited. Each order is recorded by the dispatcher and when an order is given a driver by telephone it is written on a form and after the work has been performed the order is delivered to the "store office." The trucks and wagons all report to the dispatcher whenever a trip or a work has been completed and the next work is assigned and taken up without delay.

It will be understood that there are no opportunities for the drivers to lose time unnecessarily. They are required to live up to the schedules and to complete them as early as they can consistently. In the event of accident notification is immediately given and the dispatcher provides a relief vehicle.

The wagons engaged in irregular or special work are as carefully kept track of. They are allowed time for the loading, distance travelled and the unloading, and are required to do the work in that time. The light wagons and the large truck are worked on differing assignments. The former are utilized to take injured persons to hospitals in the place of hacks that were once hired, besides doing emergency calls of all kinds. A good deal of the time of the five-ton truck is taken up hauling ashes. At one time the ashes were removed by the city teams, a work that was uncertain and unsatisfactory, but now the company delivers ashes wherever they are wanted for any purpose, making a charge for the haulage.



Manner of Hauling Ashes at the Pacific Mills, the Five-Ton White Truck Being Loaded by a Mechanical Carrier and Instantaneous Filling and Dumping Scoop, This Economizing the Time of the Machine and Its Crew.

At the expiration of each day the dispatcher's records are sent to the "store" office, where the other records are kept and from these the exact service of each machine can be ascertained.

Each driver, at the conclusion of his work, makes out a report that requires the odometer reading at 6 in the evening, the quantity of gasoline, oil and grease taken, and the work performed. In addition to this he is required to specify the accident, cause of accident, the time stopped by an accident, the time stopped from any other cause and the supplies bought and the repairs made during the day.

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PACIFIC MILLS

No.....

Tel. Order from Dispatcher.

.....M. 191

.....Chauffeur

Go to

.....

.....

.....

.....

Return this to STORE OFFICE today, after it has been filled.

Form of Telephone Order to Pacific Mills Drivers, to Be Filled in upon Receipt of Instruction from the Dispatcher.

The machines are delivered to the garage at night and there they are given whatever attention is necessary by the machinist, the electric machines are charged, and the replenishments are made. The adjusting, oiling, greasing and the like is done at night, and, of course, the batteries are examined, tested, equalized and charged during the same time.

Although the hauls are extremely short as an average the manner in which the trucks are worked results in daily mileage that is surprisingly large and will very frequently exceed what would be made by machines engaged in what is regarded as long haulage. The secret of the success of the company in operating trucks in its service is keeping them busy, and this has been made possible by a system that ought to be equally practical and satisfactory wherever adopted.

This system has made possible a saving of approximately 20 per cent. as compared with the cost of horse service under conditions where it might be assumed horses would demonstrate their greatest economy. Assuming that horse cost is the standard by which to measure vehicular service capacity, and regarding that as the unit, it will be understood that the Pacific Mills is paying but 80 cents for work that would cost $1 with horses, and basing a conclusion on the assumption that horse work is found to be from 10 to 25 cents cheaper by many who have or are using trucks for short hauls, it can be said that the efficiency of the system represents a saving of not only the 20 per cent., but the difference between the cost of truck work, whatever that difference may be.

The Pacific Mills horse service was well organized and directed. It is probable that it would show considerably less operating cost than the average installation. To save 20 per cent. of horse service cost is a remarkable showing. Contrasting this service with those of others who have used motor vehicles and continued animal methods, it is apparent that system can be as efficient and as productive in haulage as in any other work. The trucks have the capacity, but they must be operated with intelligence.

Motor truck dealers and manufacturers in California, it is reported, are taking unusual interest in the automobile show to be held in connection with the convention of the California League of Municipalities at Berkeley this fall. Models of practically every kind of a machine that may be used effectively in municipal departments will be placed on exhibition.

PACIFIC MILLS

Report for AUTO. Pac. No. For 19

Odometer register at 6 P. M. today..... Gasoline..... Oil..... Grease..... taken.

Work done:

See other side for report of accident, cause of same time stopped, supplies bought, etc.

.....Chauffeur

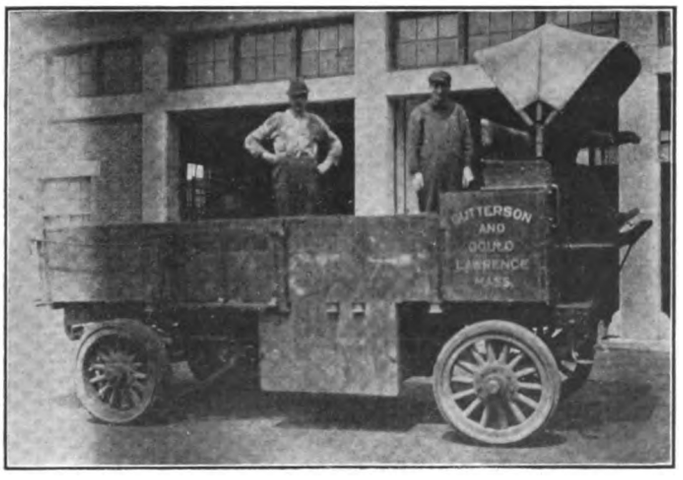
Daily Report for Drivers in the Pacific Mills Truck Service, Form 7.5 by 3.5 Inches, on the Reverse Being Printed the Following: Accidents, and Cause of Same; Time Auto Was Stopped from Accident or Other Cause, During the Day, and Supplies Bought or Repairs Made, with Space for Entry by the Driver.

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BOSTON'S GREAT ELECTRICAL SHOW.

THE electrical show to take place at Mechanics' building, Huntington avenue, Boston, Sept. 28 to Oct. 26, inclusive, directed by H. W. Moses and under the auspices of the Boston Edison Electric Illuminating Company, will be, it is promised, the largest exhibition of the kind to take place in the world. The display will occupy the entire exhibit floor space of 105,000 square feet and it will include every possible demonstration of the uses of electric energy for power, lighting, manufacturing, transporting, scientific and domestic purposes. Every manufacturer of electric prime movers, lighting installations, power tools and domestic utensils and implements of consequence in the country will be represented.

The splendid department to be devoted to electric pleasure cars and service wagons, which will be a feature throughout the period of the display, will be the first representative showing of these vehicles to be held in America. There are in all approximately 35 concerns producing either class or both classes of these machines, and it is stated that all of these will be represented. While there will be a very large number of vehicles of all kinds, it is believed that the showing of wagons and trucks will have the greatest attraction for the public because of the undoubted value of electric wagons for highway transportation.



The 3.5-Ton General Vehicle Truck in the Service of Gutterson & Gould, Junk Dealer, Lawrence, Mass.

It is pointed out that the public has manifested remarkable interest in the service obtained by the users of electric vehicles, and it is held that while there are limitations as to the work that can ordinarily be performed by them, there is but a comparatively small volume of haulage in which the electric wagon or truck cannot be profitably employed.

While there will be the display of the machines made in the building, which will include chassis with and without body equipment, as well as parts, and all forms of vehicle conveniences, the visitors will have opportunity to see trucks and wagons in actual service. This will be made possible through the fitting of a large section of the basement as a model electric garage, even to the smallest requirement, where as many of the vehicles of different makes as can be accommodated will be garaged. This garage will be conducted to a system which has been specially devised and is regarded to be the most complete and satisfactory in existence.

This garage will be in operation day and night, and as the machines will be in use during the day the visitors will have opportunity of observing the attention given to battery charging, maintenance and repair, work of all kinds upon the vehicles as occasion may require, and the regular attention afforded by a garage when the machines are brought in for the night. The work will be in charge of an expert and he will be assisted by capable men. It is expected that there will be demonstration of different work that may be required, such as care of motors and controllers, and in addition there will be exhibition of equipment and appliances useful in a garage.

The purpose is to illustrate what is really necessary and desirable in the use and care of electric wagons, to show what should be done to obtain the largest degree of efficiency with the greatest economy, and to insure practical and continuous service. This will be the first time in America, and probably in the world, that an exhibition of this character has taken place, and all of those producing vehicles have united in an endeavor which promises to be as largely productive of good results as it will be an educational factor. The Electric Vehicle Association of America and the Electric Vehicle Club of Boston are co-operating with the management of the show and each organization is devoting its influence and energies toward promoting general interest in the showing and demonstration of the vehicles.

ELECTRIC TRUCK IN JUNK HAULAGE.

Experience of Lawrence Dealer Indicates Vehicle Will Displace Five Horses in This Work.

A decidedly unusual use for an electric truck is junk haulage, a service in which Gutterson & Gould, Lawrence, Mass., is operating a 3.5-ton G. V. machine. The concern is the largest of the kind in that city and it deals in any form of metal and paper stock. The company has contract with a number of the large mills to take useless machinery or metal construction or stock of any character, which requires intermittent haulage, the service being dependent upon the accumulations. Under ordinary circumstances the junk is bought for a lump sum and is removed as quickly as possible. The material may be of a nature that makes a very bulky load, or it may be comparatively small and heavy.

For years the company used horses, it not being believed that any other form of transport would give equal satisfaction and results. The first of September

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last the electric truck was placed in service and it was placed in competition, so to speak, with a contractor who was hauling material for the company. This man owns his own equipment, has an exceedingly fine pair of horses, and drives them himself. Not only this, he is an unusually hard and energetic worker. The combination gives horse equipment of unusual efficiency, and the company has no investment and does not lose time when the animals are idle. It actually pays for nothing more than it receives, and because of regular work the owner of the horses is content to receive a price less than might be paid for occasional work.

Not only this the hauls are generally comparatively short, being seldom more than four miles, and because of the character of the loads, which must be handled and packed for haulage, and unloaded and piled at the yard, the time required is more than would be necessary for practically any other work. But despite this the machine has been a distinct saving, according to Mr. Gutterson, who says that it has been all that it was represented to be, and then some. He says that he knows nothing about what maintenance cost would be because the machine has only been out of commission two days, and this for a broken jackshaft, and he does not know what his tire cost will be as he is still using the original shoes, while he has an arrangement for garaging and attention which makes his cost comparatively small.

Regarding the work that the truck has done, Mr. Gutterson says that contrasted with the service ordinarily afforded by horse vehicles it has been in every way equal to two two-horse teams and a cart, and that if the men who man it will do the work they should it is the equal of 2.5 teams. But the loading and unloading is a distinct handicap, for there is no saving in this labor because of the nature of the freights. As to the results with the machine in winter, he says that it was driven every day through all sorts of weather and road conditions, and under all circumstances it was in every way efficient. The average mileage is about 35 daily.

The Kentucky Wagon Manufacturing Company, Louisville, Ky., which is actively engaged in the production of electric service wagons, has placed in the market a 1000-pound wagon that is intended for delivery purposes, the body being designed for carrying light and bulky packages. The body is solid and cannot be opened at the rear, this being regarded as a provision against theft or loss, and instead of the usual height of 60 inches there is full head room, so that a person within the body, while sorting or packing the load, may stand erect. The vehicle is created for meeting a demand from concerns having large delivery systems and it is believed that it will serve a distinctly useful purpose.

ELECTRICS BY THE TRAIN LOAD.

Baker Company Fills Order That Requires 10 Flat Cars to Transport.

The Baker Electric Vehicle Company, Cleveland, O., recently shipped an order or rather part of an order, of two-ton wagons to the American Express Company that required 10 flat cars to carry, there being 19 of the machines in the shipment. The accompanying photograph was made while the train was in the freight yard and it is decidedly interesting, it being probably the first time so large a number had been sent out. It is maintained by the Baker company that the order from the American Express Company is the largest ever given a vehicle manufacturer.



A Train Load of Electric Trucks Consigned to the American Express Company, This Being a Single Shipment by the Baker Motor Vehicle Company, Cleveland, O.

When the orders now in hand shall have been filled the American Express Company will have Baker machines in its service in 18 different cities, these being New York, Chicago, Boston, Dallas, Portland, Me.; Springfield, Mass.; Buffalo, Milwaukee, Lawrence, Mass.; Kansas City, Memphis, Worcester, Mass.; Syracuse, Rochester, St. Louis, Cleveland, Cincinnati and Los Angeles.

The Lansden Electric Vehicle Company, Boston, of which concern H. E. Taylor is sales manager, has established itself at 242 Columbus avenue, where well equipped salesrooms have been opened. The company is engaged in the distribution of Lansden electric service wagons in Boston and other points throughout New England.

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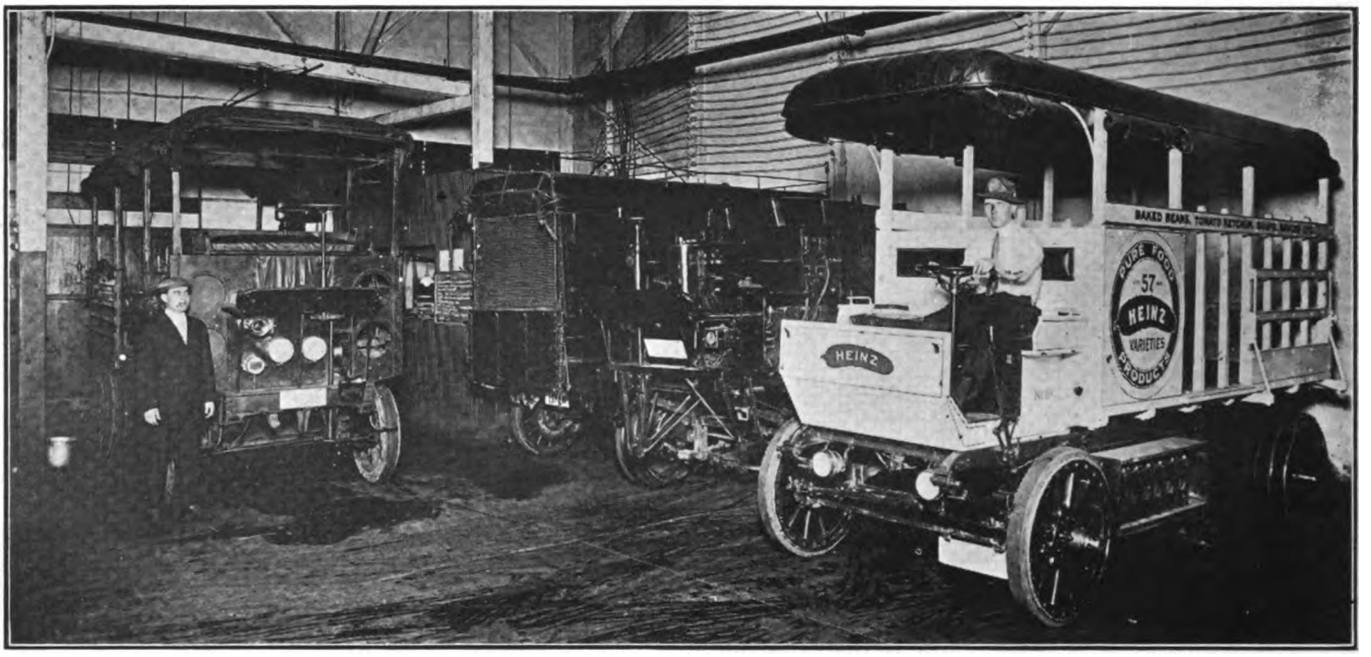
BOSTON'S EXCLUSIVE ELECTRIC GARAGE.

BOSTONIANS have been slow as compared with the people of other sections of the country in utilizing electric vehicles, and this comment applies to both pleasure and industrial conveyances. So far as pleasure machines are concerned the probable reason is the admirable roads stretching in every direction that invite and impel long distance touring. Another reason is that for years few agencies for electrics had been established and there was little or no activity in demonstrating the utility and economy of either cars or wagons.

Boston is today, however, realizing the value of the electric machine for all purposes, and through the co-operative promotion of the members of the Electric Vehicle Club, and by this organization and the Edison Electric Illuminating Company of Boston there has been inaugurated a systematic and harmonized campaign that has been productive of admirable results. As might be assumed, there is no public service station in Boston devoted exclusively to pleasure vehicles and there is but one that has been equipped to give special attention to electrics, although a considerable number essay to afford a general service for all types of machines. But with all of these patronage has been sought from owners of every class of vehicle.

There are a number of owners of electric service vehicles who have their own garages and who have equipment and facilities for charging the batteries and doing ordinary work on their machines, they depending upon the agents or upon other sources for service or attention they themselves cannot give. When the endeavors of the electric service wagon agents began to bear fruit it was found that the lack of a station where owners could obtain service such as was provided by the manufacturers of other types of machines was a decided handicap to business. Men who seriously considered electrics believed that it would not be practical or profitable for them to establish and equip a garage for one or two wagons, and they demanded the same facilities that were provided for gasoline vehicles.

With the formation of the Electric Vehicle Club and the united interest of the members, and the co-operation of the Boston members of the Electric Vehicle Association of America, it was decided that business interests demanded the establishment of a garage and the Edison Electric Illuminating Company offered to establish such a station and substantially assist in its support until it became self-sustaining. A committee was appointed to represent the Electric Vehicle Association of America to take charge of the garage proposition and to organize, establish and conduct it, this committee consisting of Day Baker, New England manager of the General Vehicle Company, as chairman, and E. S. Mansfield of the Edison Electric Illuminating Company and Frank J. Stone of the Electric Storage Battery Company as the other members.



The West End of the Floor of the Atlantic Avenue Electric Garage, Boston, Mass., Showing a Truck on the Washstand and the Others Stored About the Foreman's Office and Operating Room.

This committee was empowered to carry out the plan and it was insured the assistance and co-operation of the different organizations and their members. Because of the interest of the Edison Electric Illuminating Company in the station and the work it was intended to accomplish it was but natural that it should be actively represented in its conduct and activities, Mr. Mansfield being made the manager, he having charge of the finances and the administration, nominally under the direction of the committee. As might be assumed the purpose of the committee and the man-

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agement was to afford such a service as experience dictated would be necessary and desirable to stimulate the use of electric vehicles, and to make possible the highest efficiency of the machines that were garaged in the station.

It was realized that immediate gain must be sacrificed and that the energies of the garage management be directed toward general promotion of service and education of the public to the advantages of the electric wagon. It was maintained that much depended upon the charging of the batteries and the scientific attention that should be given to insure maximum life and endurance. Education of those who were users of electrics to the systematic care that would be productive of results was the chief object, and it was believed that when the capacity and economy of the wagons was understood there would be willingness to pay reasonable prices for high class and scientific attention.

Such was the reason for the establishment of the Atlantic Avenue Electric Garage, 476 Atlantic avenue, Boston, and the policy of its conduct. In the first few months the patronage developed apparently very slowly, but it increased substantially and this with reference to constant and transient custom, and while growth has been gradual it has been none the less satisfying. The garage was planned with a view to expansion, it having now capacity for 20 machines, but under ordinary conditions from 25 to 30 are crowded into it, and occasionally all cannot be sheltered. It is now planned to increase the garage to three times its present capacity, probably during the autumn, and when this is done the garage will have storage space for nearly 100 vehicles and adequate facilities for charging and maintaining them.

The garage is in a building placed at the disposal of the committee by the Edison Electric Illuminating Company, and it is ideally located, being in the wholesale district of the business part of the city and convenient to the railroad and steamship terminals. The garage is reasonably near a majority of business houses that might be interested in electric vehicles and is not remote from a number of the large industrial establishments. It was originally a garage for both electric and gasoline vehicles. The structure is a single story, of concrete, and it extends east from Atlantic avenue with a drive beside it. The building is about 50 feet in width and that part now utilized is about 100 feet in length, giving approximately 5000 square feet of floor area. The building is about 300 feet in length and it is intended to give all of it over to the garage when the capacity is increased. The roof is flat and about 30 feet above the floor, there being good lighting from the windows and skylights. There are two series of iron pillars supporting the roof, but these posts are not sufficiently numerous to interfere with satisfactory or economic arrangement of the wagons, although the ideal garage has a perfectly clear floor, and absence of obstructions facilitates the handling of the vehicles.



The East End of the Floor of the Atlantic Avenue Electric Garage, with the Machines Stored in Rows, the Repair Bay Being Under the Balcony Seen at the Extreme Background.

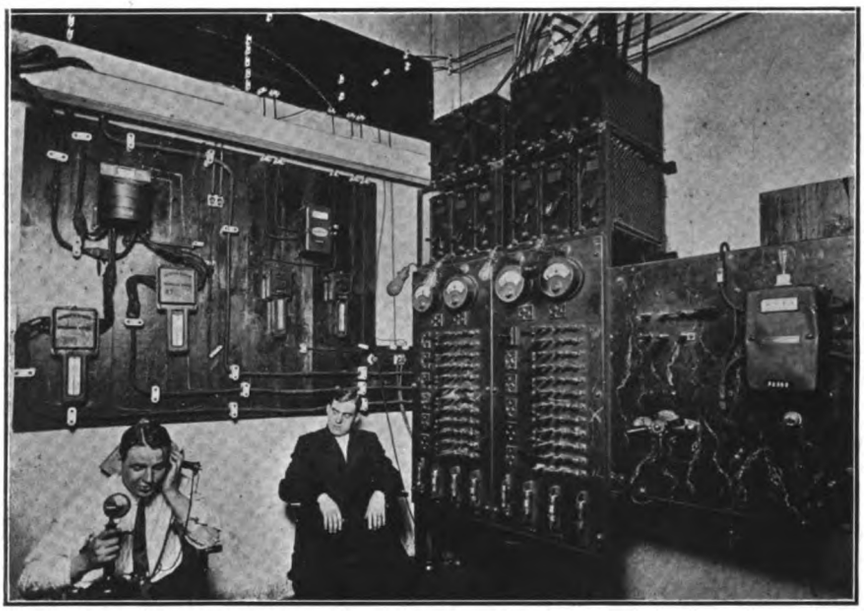
The purpose in fitting the garage was to demonstrate to those who might be interested in electric public service stations as business enterprises that it was not necessary to have elaborate or costly equipment, but it was imperative to have simple and efficient facilities so that the quality of service should be the highest and maintained at a standard known to the public. Artistic effect was lost sight of, but there is a very practical impression upon every visitor. In announcements to the public it was stated that it was not the purpose of the garage management to enter competition with other stations where customers were receiving satisfactory attention, but it was intended to provide a station for the benefit of owners within a reasonable radius and to afford the best of service to those who could not procure it elsewhere.

The plan of service adopted was to make a flat rate a vehicle a month, this single charge covering storage,

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electric current irrespective of mileage driven, battery testing, battery flushing, battery equalizing, oiling, greasing, adjustments and minor repairs, washing and polishing, with advice by experts when desired. It was also purposed to undertake any work of restoration or repair, including motor and controller upkeep, battery examination and renewal, lead burning, replacement of electric lights, renewing worn or broken parts, and to provide and install tires at the regular commercial prices. It was further emphasized that there would be machines always ready for towing in the event of accident or failure, for which reasonable charges would be made, and that these would be available for hire should vehicles be withdrawn from service for painting or repair.

The charging installation was important and this consisted of two General Electric panels, each having mounted on it six charging switches, indicating instruments and General Electric charging rheostats, through which the current is carried to Anderson charging receptacles or charging lines conveniently located. The current is obtained from a direct current three-wire main. This permits charging 12 vehicles at a time, which was believed to be as great a number as would be receiving attention simultaneously. It may be said, however, that with the present patronage the charging board is not by any means sufficient, and with the enlargement of the garage the capacity will be increased at least three, and probably four, times.



The Office and Operating Room of the Atlantic Avenue Electric Garage, Showing the Charging Panel, Which Has a Capacity of 12 Machines.

The arrangement of the garage is a parallelogram with its length east and west. The drive is at the south side and the two large entrances are from that side These doors are often opened to afford maximum light. In the northwest corner is the operating room, which contains the charging panel and switchboards, and in this is the office of the superintendent and the clerk. This room is divided from the main floor by a half-partition surmounted by a wire screen. Next south of this is the washstand, and beyond the washstand is floor space available for storage, a section of which is devoted to battery care and maintenance.

About 20 feet from the east end the floor is dropped about 18 inches and in this area practically all of the repairing is done. In the southeast corner is a panel for charging ignition batteries. Along the wall extends a work bench, and beyond this is a flight of stairs leading to a mezzanine floor. Under the staircase is a large closet in which oil and grease are stored. On the mezzanine floor is a stock room in which parts for several makes of vehicles are carried, and there is a room fitted for the convenience of the drivers with tables, chairs and lockers for their individual property. The remainder of the floor space is devoted to the storage of machines. There is a very good equipment of such hand tools as are useful, but aside from electric drills there are no power tools. There is an arrangement with a high class machine shop, however, which will produce whatever special work is necessary either nights or Sundays, and this has been thus far more economical than to install machines that would not be constantly productive. The garage is lighted by Mazda lamps fitted with holophane reflectors.

In the records of the garage operating and maintenance data are kept in detail so that it is possible and practical to compute exact costs of all descriptions for the information of the customer or for the purpose of making commercial comparisons. While the patrons still have the benefit of the flat rate for service charge, it can be said that the garage is now self-sustaining and has become firmly established.

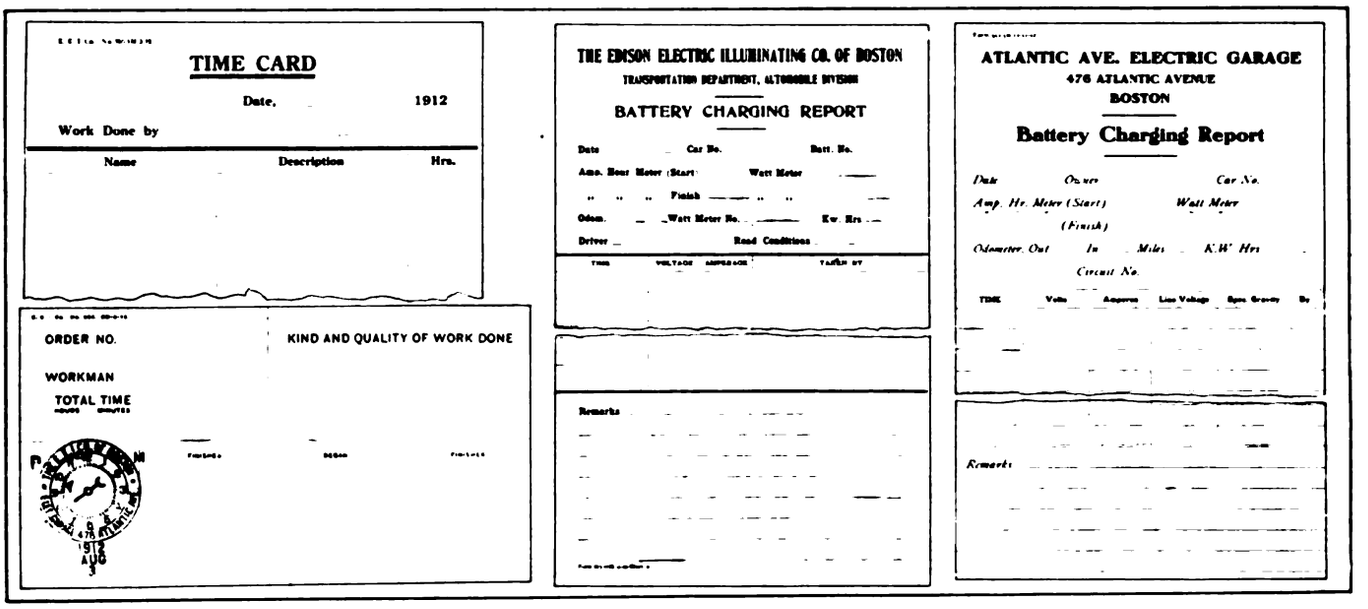
The attention given has been outlined. When an owner desires the garage service he is required to state whether he, or his driver, or who, will give orders for work other than is called for under the head of regular service maintenance. In some instances the superintendent of the garage is instructed to use his judgment as to what had best be done. All work, however, must be authorized. Under the system when a driver reaches the garage from his day's work, if his car needs any attention aside from that usually given, he notes on a blackboard his report and the condition as he has observed it. With this report as a guide the superintendent or the night foreman makes examination and if authority is necessary it is sought and obtained.

The order is then made out on a blank form which specifies the order number, the kind and quality of work to be done, and the name of the workman who is to perform it. This is stamped with a time clock stamp when the work is begun and it is similarly stamped when the work is completed, each blank having space for two beginning and two finishing stamps. This provides for an interruption of the work. On the back of the order is a space for explanation under the head of

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"remarks." The total time in hours and minutes is noted on the order when the work is completed. In the event of stock or parts being used these are withdrawn from the stock room by requisiton and the price is charged to the job by order number and by the name of the owner. The amount of the bill is the charge for material or parts plus the amount for time. In addition to the record of the order each workman keeps a time card record that is handed into the office at the finish of work for the day or night. This time card gives the name of the workman, the date, the name for whom the work was done, a brief description of the work, and the number of hours occupied with the work, each separate job being specified. The time cards and the order record ought to coincide as to hours worked. If the workman is engaged in regular service work this is indicated by the time card.

For any repair or restoration aside from the regular service the prices for materials or supplies are established. In some instances work might be under-



Forms Used at the Atlantic Avenue Electric Garage: Upper Left, Workman's Time Card; Lower Left, Order Blank for Extra Work; Centre, Edison Electric Illuminating Company's Charging Blank; Right, Garage Battery Charging Report.

taken for a given price, but this is seldom done.

Under normal conditions of service the machine when brought into the garage is immediately placed on charge. When it is washed the charging is stopped and when the washing is finished charging is resumed. Then later in the night the metal is polished. Usually each machine is oiled and greased every other night, or three times a week, and once each week an inspection is made of the nuts, bolts and cotter pins, the wearing parts are examined for wear, and the motor and controller are looked over. Adjustments and the like are made immediately when need is noted and if there is a condition developed that requires attention the owner is notified. His instructions are awaited. The batteries are inspected with great care and whenever necessary are equalized and brought up to the standard. In the event of need a battery may be removed for restoration and replaced temporarily by another.

In charging the batteries unusual care and extremely complete records are made. There are two forms of report, the one for service of the garage and the other for use with vehicles owned by the Edison Electric Illuminating Company. Considering these reports it will be understood that record is made separate for each vehicle. The garage form differs from the private form in that the latter includes the number of the battery, the watt meter number, driver's name and road conditions, the last being a note of dry, mud, rain, snow, ice or other condition that might be reflected in the performance of the machine. The odometer reading is merely the total, which indicates the daily mileage. The actual times of charging, the voltage and amperage from time to time, and the name of the observer, with remarks, constitute the report.

The garage form is even more complete in that it indicates the name of the owner, the reading of the odometer for out and in and miles, and the circuit number on which the charge is made. The times of charging, the voltage, the amperage, the line voltage and the specific gravity are required each time an observation is made. Both forms show the ampere-hour meter readings and the watt meter readings at start and finish, and the number of kilowatt-hours represented by the charge. It will be noted that the blanks require numerous readings and more careful observation of the charging than is recorded on the general charging sheet, information that can be put to very good use.

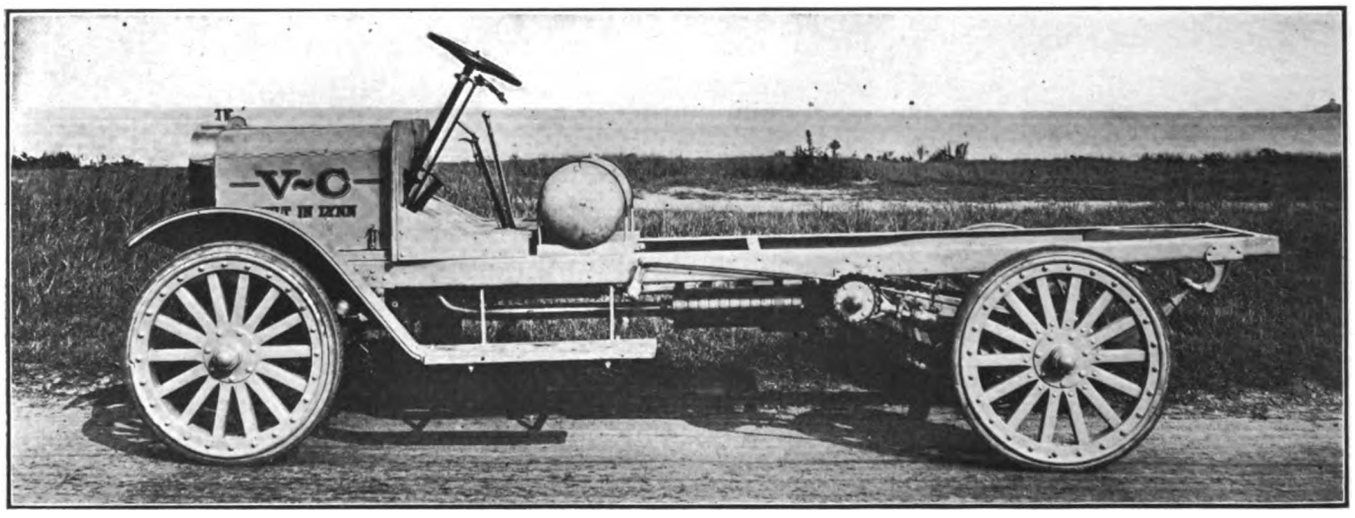
The service afforded the patrons is thoroughly good. It is maintained to a standard that is desired by those who sell electric machines, who claim that the greatest efficiency is productive of the greatest economy in actual work accomplished and minimizes expense. They insist that efficiency means better service and greater endurance of the vehicles, and that in promoting the use of electrics it is, after all, the user who is the direct beneficiary, because without the education the garage affords it would be impossible to have general application and use of common sense ideals.

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THE VC 3000-POUND TRUCK CHASSIS.

THE VC Motor Truck Company has been organized at Lynn, Mass., and has begun the manufacture of a 3000-pound delivery wagon. It is proposed to begin delivering these machines Oct. 15, and the production will be on the basis of 100 machines the first year. A factory site close to a railroad is available, an option on the property has been secured, and if conditions shall justify the company will be able to establish its plant in a comparatively short time. If the present purpose is realized the company will have its works, with admirable equipment and facilities, ready shortly after the first of the year.

The company has capital stock of $100,000. Its organizers are Frank E. Vallier, a well known shoe leather dealer of Lynn, who has been for seven years in the automobile business in that city, being agent for Essex county for the Jackson car, and since 1909 agent for the Velie car; Frank S. Corlew of Brookline, Mass., widely known in the automobile industry and trade; John P. Stevens, of Burley & Stevens, shoe manufacturer, Newburyport, Mass.; W. T. Langmaid, of the Essex Tanning Co., Peabody, Mass.; John N. Nelson, Lynn, Mass., druggist; Charles A. Alley, Lynn, real estate dealer; J. P. Croscup, Mr. Vallier's business partner, and S. D. Ritcey, Lynn, leather manufacturer. Other well known business men of Lynn are interested. The company has ample resources, and its policy is to confine its activities to New England and New York state and to establish in connection with its agencies service stations which will afford to the owners of its vehicles systematic and constant attention.



The Chassis of the VC 3000 Pounds Capacity Machine, Without Driver's Seat, Showing the Control Members.

Weekly Inspection in Service.

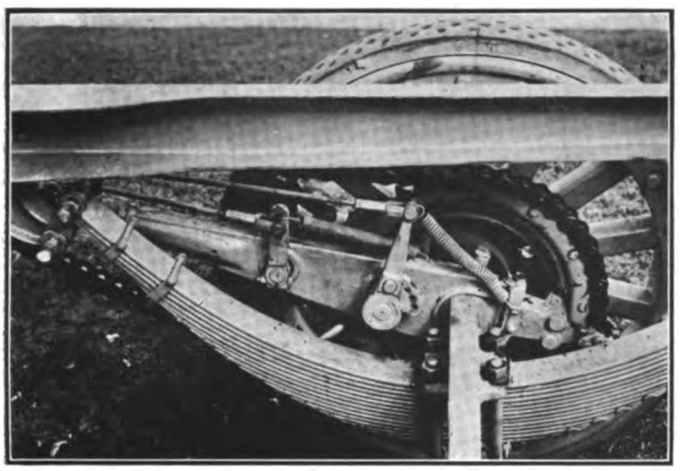
The plan contemplates the weekly inspection of every VC machine by men who will travel by motorcycles, carrying such tools as will usually be necessary for ordinary work and adjustments and who will be competent to undertake and direct whatever attention may be needed. These men will make written report in duplicate, the original to go to the owner from the company and the copy to be kept for record, which will indicate the conditions of use and upkeep and whether or not the recommendations have been followed. The men will keep the company informed of their whereabouts and will be generally available at any time when needed, as one of the requirements of the guarantee is that all work on the machines be performed by men who understand them and will not experiment. The intention is that factory service will be given, and to a degree that will insure to all purchasers the use of their machines at all times, through the prevention of conditions resultant from ignorance, neglect or abuse. It is maintained that no section of the country in which the company will be represented is more than a few hours' ride distant, and that it will be possible to supply parts or have an expert in attendance in a comparatively short time. The policy of the company is summarized in the phrase "New England Made for New England Trade," and it is believed that with the assurance of the service outlined and the high quality of vehicles produced, purchasers will be in every way satisfied.

The machine is designated as model B and it has been designed for hard service. It is intended for service where moderate loads and comparatively fast speed are required, and it has been tested under conditions where the work has been unusually severe and in every way in excess of what would be required in what may be regarded as excess service. But one chassis will be built, and there will be no changes unless a refinement has been determined as in every way desirable. That is to say, standardization is sought from every point of view.

Motor Construction.

The motor is a Continental, four-cylinder, four-stroke cycle, water-cooled, vertical, L head type, with the cylinders cast en bloc with the water jackets and the intake manifold integral. The bore is 3.75 inches, the stroke 5.25 inches and the bore to stroke ratio is 1

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The Wheel, Brake, Radius Rod, Spring and Axle Assembly, Showing the Means of Adjusting the Heavy Emergency Brake Shoes.

to 1.40. The material is a special grade of reverberatory air furnace iron, the cylinder heads and the base flanges being unusually heavy. The block is tested under a heavy water pressure to locate defects and after boring it is aged to eliminate casting stresses. After reaming and grinding to size the block is again subjected to a water test. A special process is followed in removing from the water spaces all fins, core wire, sand, scale, etc., so there are no obstructions to the water circulation. The large opening in the head of the water jacket is closed by a channelled plate which carries the outlet at the front or deepest end of the channel, this plate being retained by a series of cap screws. The block base flange is extended under the valve pockets and at either end of the block is a web, and between the recesses thus formed for the protection of the valve mechanism is the intake of the fuel manifold. The S. A. E. rating is 22.5 horsepower, the claim of the manufacturer is 30 horsepower at 1000 revolutions a minute, and that at 1500 revolutions 42 horsepower has been developed.

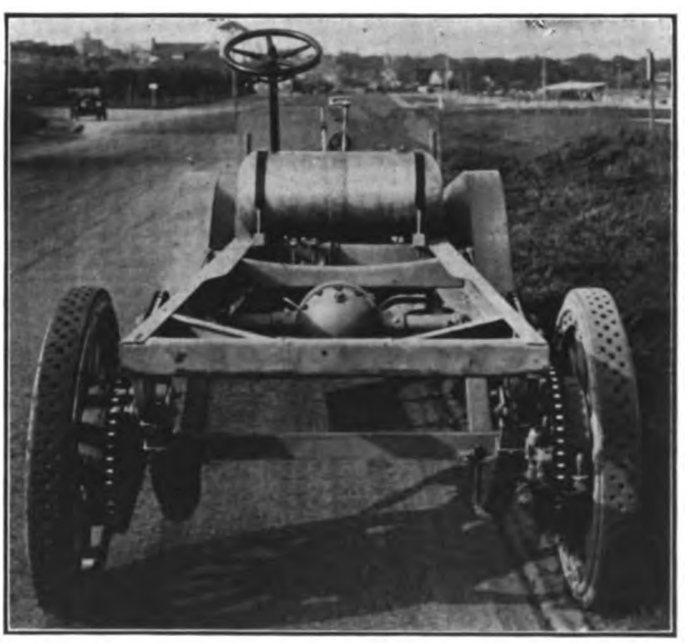
The aluminum alloy crankcase is longitudinally divided, the upper section having the supporting arms at either end and a central transverse web. This half carries the main bearings. The lower half is divided by a transverse horizontal web that contains four transverse channels. Below this is the oil reservoir of six quarts capacity. The lower section may be removed readily for work on the crankshaft and crankpin bearings. The pistons are of the same grade of metal as the cylinder block, five inches length, and are turned and ground to accurate fit. Each piston is fitted with four .25-inch eccentric expansion rings, bevel split, ground on the edges and peripheries. These are carefully tested for compression. Inside the piston are five oil grooves with leads that lubricate the outside piston and the cylinder walls. The wristpin bosses are very large and in these the wristpin oscillates.

The crankshaft is a three-bearing type of .35 to .45 carbon steel, drop forged and heat treated, with tensile strength of 90,000 pounds to the square inch. Flanges take the end thrust. The bearings and the crankpins are 1.75 inches diameter and the bearings are respectively 2.75, three and four inches length for the front, centre and rear. This gives 9.75 inches total length bearing surface. The bearings are of nickel babbitt and are held by brass retaining screws. The connecting rods are drop forged steel, 10.5 inches length, I section, heat treated, bored and reamed on special machines to insure alignment. These have big end bearings 2.5 inches length, of nickel babbitt, the caps being each retained by two nickel steel bolts with locked nuts. These are fitted with shims for adjustment for wear. The wristpins are hardened steel, accurately ground, clamped in the connecting rod small ends by one bolt. The bearing surface in the piston bosses is very large.

The camshaft is a low carbon steel drop forging with the cams integral. After turning and rough machining the cams, the shaft is annealed and heat treated, and is then finish ground on a special machine. The camshaft diameter is 1.0625 inches, with the bearings of nickel babbitt respectively 2.25 inches diameter and 2.3125 inches length, 1.125 inches diameter and 1.5 inches length, and 1.875 inches diameter and 1.25 inches length for the front, centre and rear.

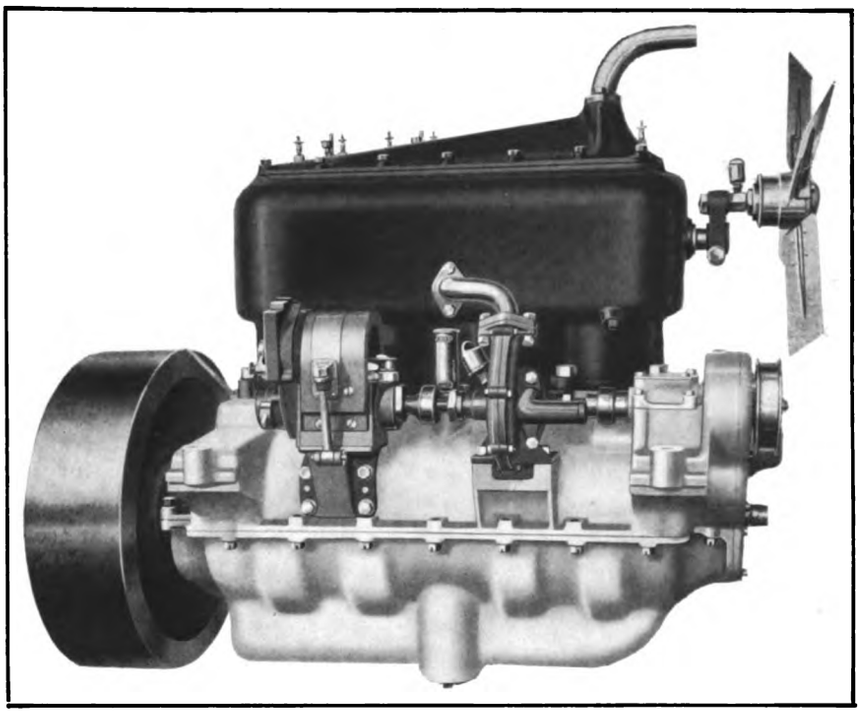
The valve ports are two inches diameter and the valves are nickel steel heads and carbon steel stems, electrically welded. The valve seats, heads and stems are carefully ground. The clearance insures the complete scavenging of the cylinders and the fullest charges of fuel. The valve stem ends are hardened. The valve springs are oil tempered. The valve guides are cast iron bushings. The valve tappets are case hardened chrome nickel steel of mushroom type, accurately ground, which operate in cast iron guides seated in the cylinder flange. The upper ends of the tappets are fitted with steel adjusting screws and nuts.

The timing gears are alternately cast iron and drop forged steel, helically cut on automatic hobbing machines, and the set consists of crank, cam, pump shaft



Rear View of the VC Chassis, Displaying the Heavy Frame, Axle, Jackshaft and the Underslung Spring Construction.

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The Right Side of the VC Motor, Showing Magneto and Water Pump Drive.

and idler gears. Especial attention has been given to the maintenance of gear centres and noise is practically eliminated. These gears are housed in an extension of the crankcase by a cover plate.

Combination Lubrication System.

The lubrication system is a combination of splash and force feed, two plunger spring returned pumps actuated by cams on the camshaft forcing oil to the rear main bearing and the timing gearcase through separate leads. The drainage from these is to the oil pool in the engine case and thence the overflow is to the oil reservoir. The lubrication of the main, crankpin, camshaft and wristpin bearings, and of the cams, valve tappets, piston and cylinder walls, is by splash from the sweep of the scoops on the connecting rod big ends in the oil pool. The oil is effectively filtered.

Cooling System.

The motor is cooled by a circulation of water through the motor water spaces by a centrifugal pump driven by an outside shaft on the right side of the engine. The inlet is at the base of the water jacket space and the outlet is through a large curbed brass outlet to the big cellular radiator. The radiator is mounted on a Mercedes type of ball trunnions which eliminate all stresses upon the cooler. The capacity is 6.5 gallons. Radiation is assisted by a four-bladed steel fan mounted on an adjustable ball bearing bracket on the forward end of the cylinder block, driven by a flat belt from a pulley installed on the extension of the camshaft.

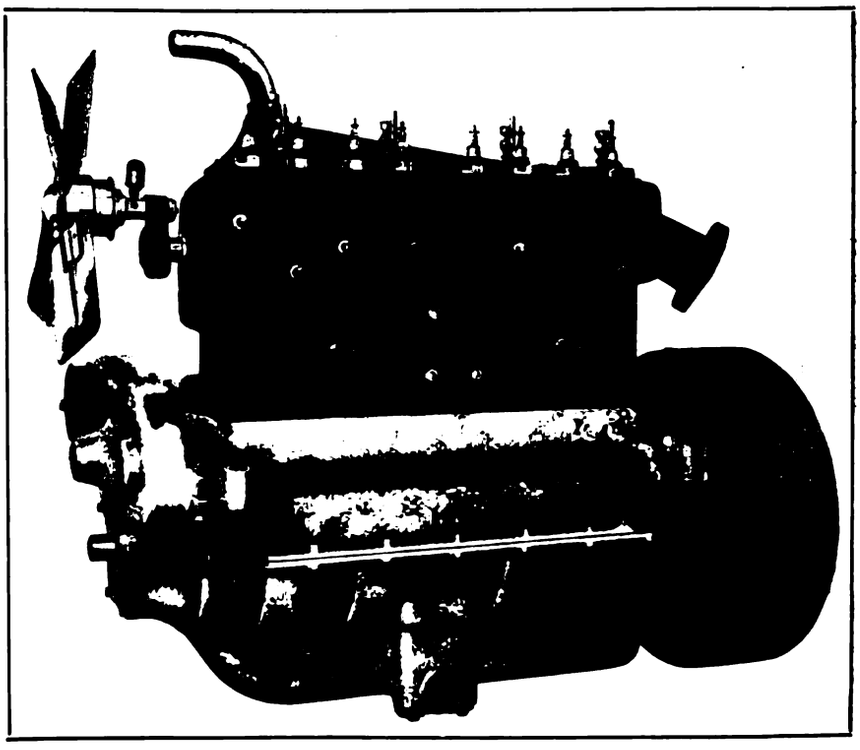
The ignition is by a Bosch magneto located at the right side on a bracket and driven by an outside shaft that operates the water pump. There is a battery of dry cells from which a current is supplied through the transformer coil located on the dash under the hood, where it is fully protected. There is one set of plugs located in the cylinder block above the inlet valves.

The fuel is atomized through a Schebler model D carburetor, an automatic float feed type, that has been particularly adapted to this motor, affording a uniform mixture at all engine speeds and under all conditions of operation, insuring exceedingly economical service.

Clutch and Transmission.

The flywheel is cast iron, 17.5 inches diameter and four inches face, bolted to a flange on the crankshaft. The clutch is of the cone type with a facing of Raybestos that insures ease of engagement and positive action without slipping. The clutch is fitted with a brake to prevent spinning and to protect the transmission gearset gears when changing speed ratios. There is a ball bearing that takes the thrust of the clutch spring. There are two universal joints between the clutch and the main shaft of the gearset, which compensate for any distortion of the chassis frame. Liberal grease cups are provided for lubrication.

The transmission gearset is a selective type with three forward speeds and reverse and it is supported at the forward end by a cross member, and at the rear it is bolted to the jackshaft housing. The shafts and gears are nickel steel of generous size and are care-



The Valve Side of the Motor of the VC Chassis.

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Frederick Byron, Inspector of the VC Motor Truck Company, Responding to a Call on His Motorcycle.

fully formed, the spur gears being cut and finished with much care, and they are both heat treated. The shafts are mounted on New Departure annular ball bearings. A large cover plate, easily removable, affords access to the shafts and gears. The control levers are carried in a very heavy cast steel bracket that is mounted at the rear on the sub-frame and forward on the cross shaft that supports the clutch and brake pedal cranks. The lever quadrant is of the H type.

The jackshaft is contained in a pressed steel housing that contains the differential gearing. This housing is supported at either end by heavy brackets that are combined with the spring hangers and by loosening the retaining bolts the jackshaft may be dropped from its supports. The brackets have very large bearing surfaces and these are of the globe type in which the housing may move under stress of chassis distortion. The bevel gear is extra size and the gear and the differential pinions and gears, are of nickel steel. The differential is mounted on New Departure annular ball bearings. The axleshafts are nickel steel, 1.375 inches diameter, hardened and heat treated. The outboard jackshaft bearings are New Departure annular ball type. The reduction chains to the rear wheels are a detachable form of standard make.

Rear Axle Construction.

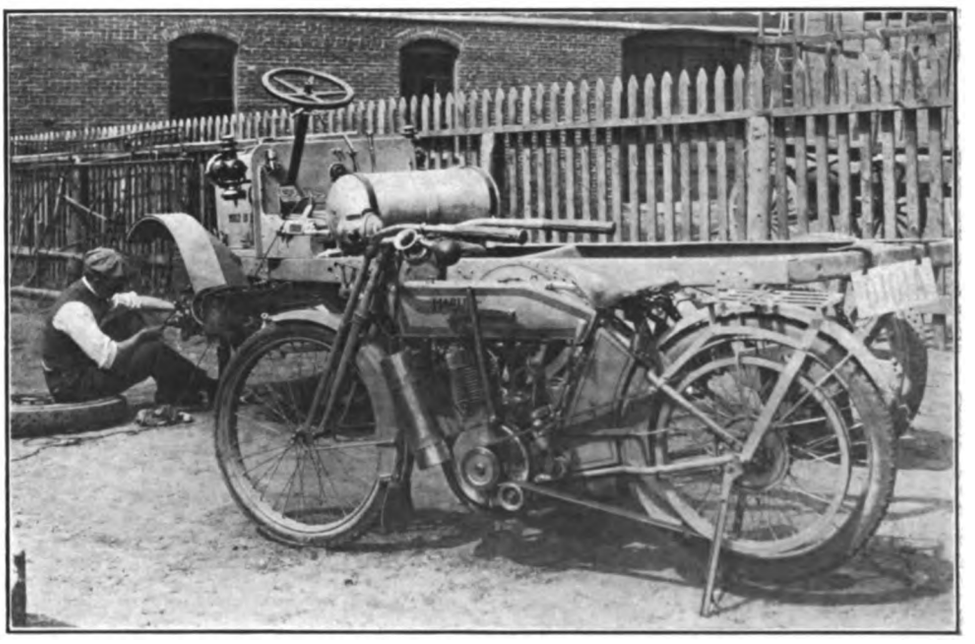
The rear axle is a steel drop forging 7.875 inches width and 2.875 depth with the spring seats integral. The radius rods are fitted on bearings on the axle and are attached to the jackshaft housing with screw and lock nut means of adjustment. The rods are of unusual strength. The front axle is a heavy I section drop forged from nickel steel, with large yokes. The steering pivots are extra size and are nickel steel, with hardened steel bushings and ball bearings. The wheel spindles are nickel steel and are fitted with New Departure annular ball bearings. The tail lever and drag link are steel drop forgings, and the tie bar, of similar material, is placed behind the axle for protection. There are means for adjustments to compensate for wear.

The frame is a hot rolled low carbon steel, pressed cold, channel section, .25 inch thick, 4.5 inches depth and four inches width. There are two heavy cross members and the rear member is strongly braced with long diagonals. The forward spring horns are heavy steel drop forgings bolted to the frame. The forward cross member effectually protects that radiator. The springs are semi-elliptic. The front set is 42 inches length and 2.5 inches width, with 10 leaves. The rear set is 48 inches length and 2.5 inches width, with 14 leaves, these being underslung and having an unusual arch to insure extreme ease of action. They are of silico-manganese steel. The forward springs are shackled at the rear, and the rear springs at both ends, the drive being through the radius rods.

The steering wheel is at the left side and the gear is an irreversible type in which the construction is completely enclosed and is oil tight, with adjustments practicable at every wearing point. The wheel is 18 inches diameter, with a five-spoke spider and a steel rim covered with hard rubber. The spark and throttle levers are on the steering column under the wheel.

Brakes, Etc.

The clutch is actuated by the left pedal and the service brake by the right, the pedals being of unusual size. The leverage is powerful and the operation of both clutch and brake requires comparatively little pressure. The service brake is an external contracting type, the shoes being lined with Raybestos and contracting on a steel drum 14 inches diameter and 2.5 inches face bolted to the spokes of the rear wheels.



Inspector of the VC Motor Truck Company Putting on a Speedometer, His Motorcycle Ready for Instant Use.

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The emergency brake shoes are faced with Raybestos operating within the drums. The brake drum is not closed by a flange carried on the axle or the radius rod, but is open, and the emergency brake is adjustable for wear by a toggle lever that is mounted on the radius rod and may be changed to secure any desired clearance by changing the pin on which it is carried. It is kept clear of the brake drum by a spring. The service brake is also mounted with the lever carried on a pin on the radius rod. Both brake rods are adjustable as to length by screws and lock nuts. The wheels are artillery type, of second growth hickory, 36 inches diameter, fitted with demountable tires, the make being optional with the purchaser. The wheelbase is 130 inches and the tread is 56 inches.

In the design provision is made for carrying a body weighing 700 pounds and a load of 3000 pounds, the weight being 40 per cent. on the front wheels and 60 per cent. on the rear wheels. The dash is of wood. The gasoline tank is a steel cylinder under the driver's seat and has capacity of 20 gallons, three gallons of which is reserve. The tank is clamped to the frame by heavy straps and may be located as desired.

CAUTION

OVERLOADING OR OVERSPEEDING WILL VOID YOUR WARRANTY

[ ] TON TRUCK

NO. [ ] SPEED [ ] MILES PER HOUR

	STANDARD		ACTUAL	
WEIGHT OF CHASSIS	[ ]	LBS.	[ ]	LBS.
STANDARD BODY ALLOWANCE	[ ]	LBS.	[ ]	LBS
USEFUL LOAD CAPACITY	[ ]	LBS.	[ ]	LBS.
TOTAL WEIGHT, CHASSIS, BODY AND LOAD, NOT TO EXCEED	[ ]	LBS.	[ ]	LBS.

Space for Individual Manufacturer's Name and Address

Form of Standard Caution Plate Recommended by National Association of Automobile Manufacturers.

The weight of the chassis is 3540 pounds. Mudguards are furnished for the front wheels and the running boards are short, the brackets being braced by two cross stays below the frame. On one running board is the tool box and on the other the battery box. The equipment includes two dash and one tail lamp. The usual jack and the tool kit are also supplied.

Throughout the chassis is the evidence of careful design. Great care is taken to insure lubrication of all moving parts and steel grease cups of liberal proportions are provided; there is a large bracket with a long bearing for the starting crank; the radiation system is 25 per cent. larger than the average for machines of this size; there is a stout bumper to protect the radiator; the front spring horns are extra heavy; the control lever bracket is practically unbreakable; the steering gear is very heavy; the frame is unusually stiff and strong, and every part is very accessible. The engine-road wheel revolution ratio is eight to one on direct drive, 12 to one on intermediate, 24 to one on low, and 26 to one when reversed.

The chassis has a loading space back of the driver's seat 113 inches length and 48 inches width between wheels, and the body may be increased to any desired length or width by overhanging the chassis and placing a bolster upon it.

REGARDING CHASSIS RATING.

Commercial Vehicle Committee of National Association Answers Correspondent.

In the August issue of MOTOR TRUCK, Morris R. Machol, general manager of the Hydraulic Truck Sales Company, New York City, discussed at some length the matter of chassis rating, with reference to the type of body fitted thereto. The following communication is in the nature of a reply, Mr. Machol having expressed a desire that the subject be thrown open to general discussion:

Editor, MOTOR TRUCK.

Sir:

The letter from Mr. Morris R. Machol, published in your last issue, in which he makes objection to the rating of truck chassis by tonnage capacity without regard to the weight of the body, deals with a subject that has been discussed by the commercial vehicle committee of the National Association of Automobile Manufacturers in connection with the allied subjects of body weight allowances, overload and standard caution plates.

Mr. Machol's criticisms of chassis ratings irrespective of body weights are well taken, as it is obvious that the weight of the body has a great deal to do with the safe useful load capacity. The difficulties in the way of rating trucks any other way are equally plain, however; the chassis cannot be rated by net load carrying capacity, because the chassis is often sold without body and the maker does not know what style or weight of body is to be fitted.

Under the conditions, it seems as if the fair way is to rate the chassis by gross capacity, including body, as, "capacity, five tons with body." This leaves the buyer no excuse for assuming that the maker guarantees the chassis to carry five tons in addition to the body, whether it is an open stake body or a heavy closed van body weighing a ton or two.

It is to bring about a better understanding of just such points as this that the commercial vehicle committee of the N. A. A. M. has been giving much attention to truck ratings, warranty, body weight allowances, caution plates, and so on.

It is directly to the point in this connection to call attention to the form of caution plate recommended at the June 4 convention of motor wagon makers, copy of which is shown on page three of the minutes of the meeting enclosed. You will note that provision is made for stamping in with dies the standard and the actual weights of the chassis, the body, the net load capacity and the total weight on the scales.

General use of this plate will allow of no misunderstanding of the load rating of the chassis, as all the standard weights (which will be the same for all standard chassis of the same model) will be stamped on the plate before the chassis is offered for sale, and it will be apparent from the figures that the body weight allowance has been deducted from the tonnage rating to arrive at the net load capacity. The actual weight of body, useful load and total weight will be stamped in by the local dealer after the body has been built and fitted.

This plate meets the requirement pointed out by Mr. Machol when he writes: "The chassis should be labeled with the actual load that it is built and designed for, and the weight of the body should be subtracted from this capacity when the actual load carrying capacity is figured."

When this plate is used in conjunction with the standard warranty recommended by the N. A. A. M., the manufacturer is relieved of any erroneous assumption by the purchaser that the chassis is guaranteed to carry its full rated capacity plus the weight of any type of body the buyer elects to mount on it. (As a matter of fact, guarantees as now printed in catalogue, do not guarantee the carrying capacity of trucks, but warrant the mechanism against defects in materials and workmanship. If purchasers are misled with regard to load capacity, it is by verbal statement of salesmen or by their own inferences.)

In personal correspondence on this subject with the undersigned, Mr. Machol writes: "We believe what should be done is to rate the chassis according to its gross load capacity and make the purchaser realize that the weight of his body is a considerable feature or factor"—precisely what is contemplated by the caution plate.

Very truly yours,

H. W. PERRY,

Secretary Commercial Vehicle Committee.

7 East 42nd street, New York City, Aug. 8.

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FEDERAL TRUCK CLIMBS MOUNTAIN.

First Commercial Vehicle to Negotiate Mount Wilson Grade on Pacific Coast.

The record of being the first commercial vehicle to climb Mount Wilson in California, is held by a Federal, made by the Federal Motor Truck Company, Detroit. E. Roger Stearns, vice president of the Standard Motor Car Company, Los Angeles, Pacific Coast distributor for this make of car, recently drove a one-ton machine over the old toll road, usually utilized only by burro caravans, the distance being 14 miles and the altitude 5700 feet. It took less than three hours to make the ascent, and the descent was made in 1:45:00.

This company is having decided success with the Federal in this territory, judging from the fact that it has sold 85 cars in and around San Francisco and Los Angeles during the past year. Last month it ordered 28 more machines.

LOS ANGELES SELECTS AUTOCAR.

Decides Upon This Make for Municipal Service After Testing Numerous Machines.

After tests of a number of makes of machines, Los Angeles, Cal., recently placed an order for several one-ton Autocar trucks, made by the Autocar Company, Ardmore, Penn., for use in several municipal departments. The tests to which the vehicles were put were unique. Each agent competing for the order supplied a truck at the city garage. Each truck was driven by a representative of the agency, accompanied by a mechanic employed by the city. The instructions were that the mechanic and driver were not to talk to each other, the driver was not made aware of the destination, neither did he know what, in the eyes of the mechanic with him, would constitute a demerit, and not until the return to the starting point was the result announced. The journey consisted of a round trip through a certain park system, then up some of the steepest hills to be found in the vicinity of the city and out through a sandy stretch almost impassable, and then back to the city.

B. O. E. MAKES REMARKABLE RECORD.

Hauls Big Consignment of Sugar from Philadelphia to Harrisburg Without Difficulty.

A 3.5-ton B. O. E. truck recently completed a run from the Franklin Sugar Refining Company's plant in Philadelphia, Penn., to Harrisburg, the same state, covering a distance of 397 miles in 10 days, and delivering to the Whitman, Schwartz Company a 45,000-pound consignment of sugar. In addition a horse wagon, loaded with 15 barrels of sugar, each weighing 365 pounds, was used as a trailer. The vehicle withstood the trip without a defect in any way, but the wheels of the trailer had almost collapsed from the heavy load. The truck was equipped with Diamond tires, Bosch magneto, T-A-D spark plugs, Diamond drive chains, Hele-Shaw clutch, Cotta transmission and chome nickel steel jackshafts, made by the Carpenter Steel Company, Reading, Penn., Holley carburetor and Blood Bros. universal joints. Keystone grease and Vacuum Mobiloil were used.

SHOULD CARE FOR TRUCKS.

General Motors Official Holds That Driver Should Inspect His Car Each Day.

Vice President Gleason Murphy of the General Motors Truck Company is very emphatic in his views regarding the care of commercial vehicles. He says they should be given attention at all times, and advocates that an owner should get his driver into the habit of making a thorough inspection of his machine at the end of each day's work. Speaking of the contention that the life of a truck is limited, Mr. Murphy says:

"I know a truck that has been in use over six years and is doing good service today. Proper care has brought about this long record. This also embodies the statement that a truck's period of usefulness is limited. It all depends on the care given and if owners would realize the importance of this point they would find that motor trucks would not depreciate so rapidly, and would give a surprise in the daily work."

Swift & Co., the well known meat packing house, has adopted the mechanical transport in several cities in which it operates distributing branches. In order to secure the utmost efficiency from its equipment, this concern takes particular pains to instruct its drivers in the use of the motor vehicles. A card, bearing several "Do's and Don'ts" for drivers, as well as the local and state regulations respecting the use and speed of such vehicles, is presented to each man, this bearing the signature of the superintendent, and each driver is held personally responsible for the care and maintenance of his car. The object is to reduce the possibility of accidents to a minimum, and the plan has been found to work out most admirably.

R. C. Kimball, formerly a division engineer with the Detroit River Tunnel Company, in charge of constructing the Windsor, Ont., end of the Detroit river tunnel, and for several years engineer with the Pere Marquette, Detroit, has been appointed district manager of the Cleveland-Galion Motor Truck Company, with headquarters in Detroit. Mr. Kimball is at present engaged in working out the problem of reducing the cost and time of handling freight in factories, railway terminals and warehouses by the use of the dynamic warehouse truck.

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TRUCKS IN CONNECTICUT ARMY MANOEUVRES.

Successful Demonstration of Practical Utility, Despite Conditions Which Prevent Cars from Showing to Best Advantage—Some General Results Obtained.

WHILE the use of motor trucks instead of mule wagons in army work was given its most extensive trial, insofar as the American government is concerned, in connection with the recent manoeuvres in Connecticut, it will be some time before the general public is acquainted with the results obtained. Some facts seem to stand out pre-eminently in a general consideration of the problem, but even these cannot be regarded as finally established, largely because most of the vehicles employed were secured at the last moment and were in no sense constructed for army work.

This last feature is of decided importance, when it is remembered that army wagons are expected to traverse ways that by no stretch of imagination can be declared roads in the accepted use of that term. Mule teams are called upon to haul loads through underbrush, even, and across open fields. It goes without saying that trucks which are intended for use over city and suburban ways, as were most, if not all those employed in the recent manoeuvres, cannot hope to meet all requirements of such service. It would appear some of the commanding officers were not aware of this phase of the situation, and in a few instances the vehicles were assigned work which was beyond what could be reasonably expected of them.



Saurer "Pioneer Freighter" Loaded with Camp Equipment and Ready to Take the Field.

However, sufficient was learned to indicate that no future manoeuvres will be held without the presence of motor trucks, and in ever increasing numbers. And it may be well to add that those in charge of such trials will work in conjunction with manufacturers in an effort to solve the army transportation problem. That the trucks showed up so well, under the circumstances, is sufficient indication that vehicles constructed with some idea of what is expected of them will put a very different light upon the matter of army haulage.

Both armies were plentifully supplied with trucks, among the makes represented being the following: White, Pierce-Arrow, Saurer, G. M. C., Packard, Alco, Sternberg, Decatur, Kelly, Gramm and Federal. Several pleasure cars also were used by the officers for quick communication between various sections of the field, these including: Pierce-Arrow, Cadillac, Franklin, Hudson, Stevens-Duryea, Matheson, Lozier, Mitchell, Thomas, White and Panhard. The carrying capacity of the trucks varied from 1500 pounds to five tons, with the average between two and three tons.

Mule wagons have a capacity of 3000 pounds. Usually this is hauled by four mules, but when it becomes necessary to leave the main road and take to the cross country routes, this number is increased to six or eight. When the road conditions are what might be regarded as ideal the mule team will average about 2.5 miles an hour. When the mule can no longer haul the wagon, because of the condition of the ground over which it is desired to transport the load, it becomes a pack animal, capable of carrying some 300 pounds.

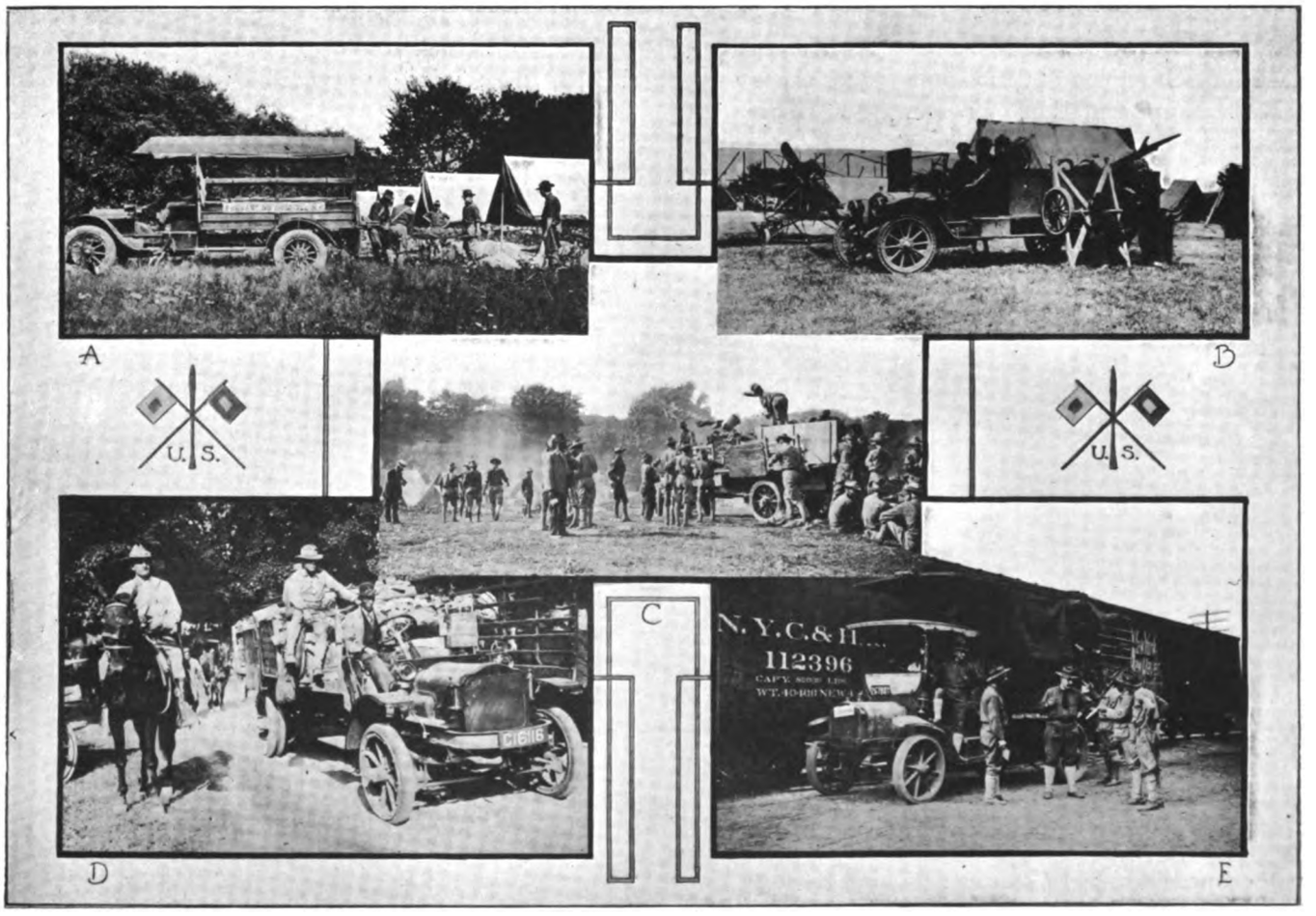
With the trucks, it was found that most of them could stand a substantial overload. This applied particularly over good ways. Perhaps it might be said that one of the results of the trials was the demonstration that motor vehicles were able to supplant the railroad in reaching the field of activity somewhat distant from the main base of supplies, so that a much smaller detachment of men was necessary to guard the main depot. To summarize this situation, it may be stated that trucks of from three to five tons capacity were found most desirable for transporting supplies, etc., from the main depot to the minor distributing points, from which they could be delivered in the field most advantageously with vehicles of less capacity.

One of the trucks, assigned to one of the New York

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regiments, was sent over the road from Stratford, Conn., to New York City and return, a distance of 120 miles, in 12 hours, this time including 4.5 hours spent in loading. The roads over this stretch were considered as particularly good, although they were worn in one or two places. The average speed of 18 miles an hour may be compared with the 2.5 made by mule wagons, but it cannot be regarded as absolutely conclusive, inasmuch as a large proportion of the hauling was accomplished over roads which would in no way compare with those of the shore line into New York. In many cases the hills were so steep that the mules were unable to negotiate the grade, particularly in the excessive heat. And this presents another view of the impossible to make such detours, in which case it would be necessary to have trucks designed for this particular purpose.

It was demonstrated that the smaller trucks were able to make two or three trips, one after the other, without difficulty. This is nothing new, when it is remembered that fire apparatus, for instance, frequently is called upon to answer a second alarm soon after returning from the first. This feature of the motor truck has been demonstrated time and again in every day work. In the manoeuvres it was found that trucks operating between the main supply and secondary base were capable of averaging 48 miles a day, while those utilized for hauling between the secondary



White Trucks in Connecticut Manoeuvres: A, Ambulance in Service with the Field Hospital; B, 1-5-Ton Wagon Employed in Hauling Aeroplanes; C, Unloading Supplies for the Blue Army; D, Three-Ton Truck Arriving with Equipment from Brooklyn, N. Y.; E, Five-Ton Vehicle at the Commissary Stores at Orange, Conn., Loading Hay and Oats.

situation, since it is by no means advisable to wait until the cooler hours of the day before transporting supplies when the army is in action.

Trucks of 1.5 and two tons capacity were geared to average 30 miles an hour. These were used to advantage in delivering supplies from the secondary base to the field of action. As has been stated, conditions often were found where it was impractical to send the trucks through country which could be traversed by the mules, but in most instances it was possible to send the motor vehicles around another way with even better results, because of their ability to travel faster. Of course, situations might arise wherein it would be base and the fighting line averaged 42 miles a day.

Some special work was undertaken. For the first time in the history of the American army provision had to be made for transporting aeroplanes and aeroplane supplies. Naturally, power wagons were utilized for this purpose. For some reason, possibly because the aviators had had insufficient time in which to become accustomed to their machines, this branch of the service did not show up as satisfactorily as might be wished. This has reference to the aeroplanes; the work accomplished by the motor trucks in this line was above reproach.

There was not the same question concerning the

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vehicles utilized for hospital service, this being due to the fact that cars were employed for this purpose last year in practically every militia encampment throughout the country. They may be regarded as having thoroughly demonstrated their worth. This is wholly in line with what has been accomplished abroad.

Although no bullets were flying about to bring injuries to the contending armies, the hospital corps was kept active treating cases of heat prostration and ordinary ailments to which flesh is heir. Each army mustered about 10,000 men, and it may well be assumed that there was plenty for the motor ambulances to do. Two White 1500-pound wagons were utilized as ambulances, and they often were forced to make their way over bad roads and across farms to reach the side of the soldier who had fallen from sheer exhaustion while manoeuvring with his company. They made at least 20 such trips a day, not mentioning those to the nearest railroad stations for forwarding patients to their homes.

It is probable that the product of the White Company, Cleveland, O., leads all others in number of vehicles in service. These included two of five tons, two of three tons, three 1.5-ton wagons and the two 1500-pound ambulances. Officers in charge of these cars stated that by combining the heavy equipment of the three-ton trucks with a few of the lighter 1.5-ton wagons as auxiliaries, every objection raised thus far could be met easily. On the other hand, they were willing to concede that the trucks had some very conspicuous advantages.



Five-Ton Pierce-Arrow Truck En Route from Buffalo, N. Y., for the Connecticut Manoeuvres.

For example: Some of the batteries had an equipment of 40 to 50 teams of mules instead of motor trucks, whereas others had their entire equipment of the latter. In other words, the wagon train of the former was about three times the length of the batteries which used motors, which meant just so much more extended line to defend, a very important item. Horses or mules must be supplied with forage at every camp site, while power wagons carry sufficient gasoline to cover a week or 10 days' march—another very great advantage should the army be travelling in a hostile zone.

Probably the truck which covered the longest distance was a five-ton, worm driven Pierce-Arrow, made by the Pierce-Arrow Motor Car Company, Buffalo, N. Y. This was loaded with the property of the Fourth Brigade, New York National Guard, with headquarters in Buffalo, and sent overland to the scene of the manoeuvres, after much the same plan as that employed by the German army.

It is stated that this truck carried a load weighing some 10,750 pounds, which made the total weight of the vehicle and load about 10 tons. On the way from Buffalo to New Haven an average daily mileage of 150 miles was maintained. Because of the unusual weight of the truck and load, several long planks were carried, these being utilized to reinforce the bridges en route.

Five Alco trucks, made by the American Locomotive Company, Providence, R. I., were furnished the quartermaster's department by the Smedley Company, general transfer agent, in New Haven. These made three and four round trips a day over deeply rutted roads and through fields that had been softened by frequent showers.

These may be considered as sample statements of what was accomplished by the various vehicles. Mention already has been made of the Saurer, produced by the International Motor Company, New York City, and in this connection it is of interest to examine the report of a Mack truck, also made by this concern, in the manoeuvres in Wisconsin in June. This is set forth in the following table:

Daily Report of Mack Truck.

June	Miles	Gals. Gas	Qts. Oil
20	18	1.5	2.0
21	30	2.5	3.2
22	28	5.5	2.0
23	..	4.0	2.0
24	..	6.0	2.5
25	26	5.5	3.5
26	10	5.0	1.5
27	..	7.0	1.5
28	28	7.0	0.0
29	28	5.0	0.0

It should be stated that this is only a partial report of the work done by this truck, and covers only that portion of the tour of duty spent in camp at Middletown, Wis., and much of the travel was between the camp at Madison. All told the Mack was in service June 7-30, and covered a total of 6754.3 miles. A Sauer in the same service covered 7031.7 miles.

The recent manoeuvres in Connecticut will be made the subject of an extensive report to the governmental departments and will be awaited with interest.

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New Commercial Car Accessories

Nelson Compression Coupling.

The A. Nelson Manufacturing Company, Randolph and Jefferson streets, Chicago, is marketing a coupling for connecting tubing on gasoline or oiling systems without swaging or the use of solder. The device is made tight by means of couplings threaded over another member, the operation compressing and making the joints leak proof. The couplings are made in different sizes.

Starrett Ratchet Wrench.

The Starrett ratchet wrench outfit is produced by the L. S. Starrett Company, Athol, Mass., and comes in a neat box. The kit comprises a ratchet wrench with reversible pawl and an extension; a spark plug socket, universal joint, drilling attachment, etc. The equipment also includes 28 hexagonal steel sockets, varying in size by thirty-seconds from .3125 to 1.25 inches. The parts are nicely finished and of high grade material.

Northwestern Hydrometer and Thermometer.

Among the instruments useful about the garage is a gasoline hydrometer for testing the specific gravity of the fuel. The Northwestern Chemical Company, Marietta, O., is manufacturing a combined gasoline hydrometer and thermometer which is moderately priced and which comes in a glass testing jar and nickel carrying case. The device is equipped with a thermometer correction scale for variations in temperature.

Superior Double Spark Plug.

The Superior Motor Specialty Company, 44 North Fourth street, Philadelphia, is manufacturing the Superior double spark plug, which is provided with dual electrodes and a like number of terminals. By its use two sparks may be produced simultaneously in the cylinder of a motor, a method making for greater efficiency as well as economy of fuel as the vapor is more completely burned. The plug may be utilized for independent circuits if desired and is constructed of high grade material. The maker claims that the points are self-cleaning and that the plug may be employed as a single member.

Owen Valve Grinder.

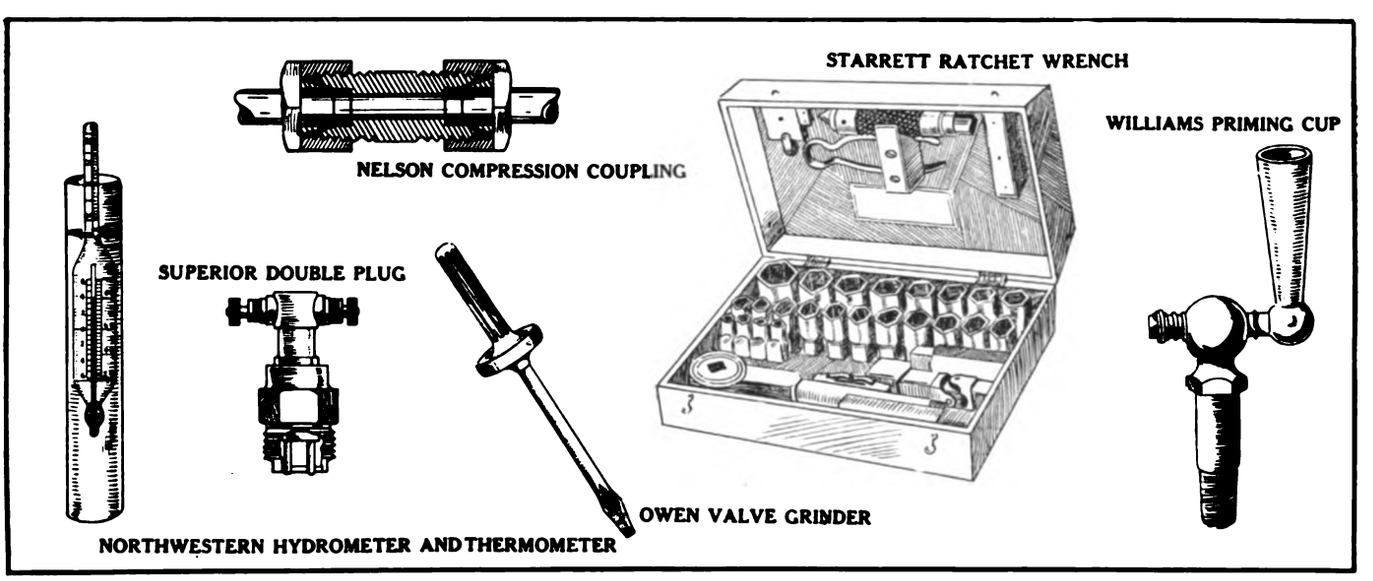
The Owen valve grinder, marketed by the Stewart Grinder Company, 171 Broadway, New York City, is designed to take the place of the screw driver, or brace and bit. The weight of the tool is such that no downward pressure is necessary in grinding a valve, the tool simply being rotated in the usual manner. The handle is corrugated and the device is nicely finished. The company also manufactures Gryndyn, a valve grinding compound which comes in screw top boxes and which is inexpensive.

Williams Priming Cup.

The Williams priming cup, marketed by the D. T. Williams Valve Manufacturing Company, Cincinnati, O., presents novel features, inasmuch as its lever is funnel shaped and when placed in the proper position its opening registers with that of the cup, permitting the flow of fluid to the cylinder. The cup is equipped with a spring key which automatically adjusts itself to wear. Another feature of the device is that when the handle is down or closed the entrance of foreign elements is prevented.

Decarbonizer.

The Milwaukee Auto Specialty Company, 128 Second street, Milwaukee, Wis., is marketing Decarbonizer which chemically removes carbon from cylinders, pistons, rings, etc., as the liquid volatilizes it.



Some Accessories Applicable to the Commercial Vehicle, Including Novel Priming Cup, Double Spark Plug, Valve Grinding Tool and Compression Coupling.

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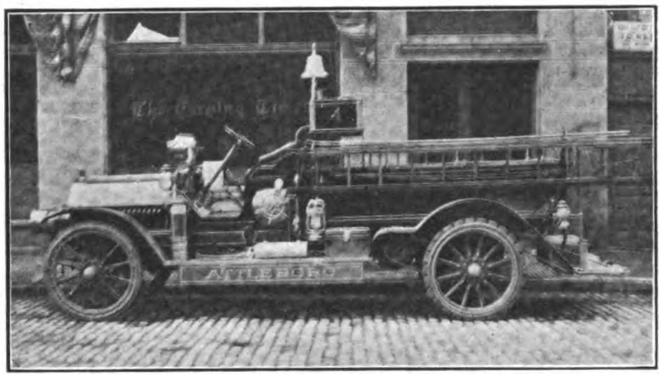


FIRE CHIEF'S CONVENTION.

Important Matters to Be Discussed at Gathering in Denver This Month.

The annual convention of the International Association of Fire Engineers, to be held at Denver, Col., Sept. 17-20, will be one of the most important gatherings of fire department officials that has taken place in recent years. Conditions have changed radically during the past few years, due primarily to the introduction of motor driven apparatus, which has placed the various fire fighting systems upon an entirely new basis.

Fire chiefs are studying closely the effect of these vehicles upon better fire protection and the coming convention will devote a large share of its time to motor trucks, hose wagons and engines. The subject promises to provoke much comment and the discussions will furnish many valuable hints as to the efficiency and shortcomings, if any, of motor fire apparatus, gained by the chiefs of many cities by observation of their practical application to the work for which they were designed. Manufacturers of automobile fire machinery are keenly interested in the convention and will follow closely, with the idea of profiting by, the conclusions drawn by the fire chiefs and insurance underwriters, who will also touch upon the topic.



Knox Combination Chemical and Hose Wagon Installed in Station at South Attleboro, Mass.

The programme contains the following papers, which will be open for discussion: "Fire Prevention and Building Inspection by Members of Fire Departments," by Fred Brodbeck, chief, Salina, Kan., and A. M. Schoen, manager S. E. Underwriters' association, Atlanta, Ga.; "The Triple Combination Hose Wagon, Chemical and Pumping Engine, Is It a Success?" by F. J. Connery, chief, New Castle, Penn.; "The Proper Location of Sprinkler Tanks. Should They Be Located on Roofs, Fire Walls or Separate Towers?" by J. A. Tremblay, chief, Montreal, Can.; "Tractors for Steam Fire Engines, Aerial Trucks and Water Towers," by John Kenlon, chief, New York City, and R. H. Bowker, chief, Passaic, N. J.; "The Care of Fire Hydrants to Prevent Freezing and the Best Way to Thaw Out Frozen Fire Hydrants," by C. W. Ringer, chief, Minneapolis, and John Aiken, chief, London, Ont.; "Direct Connection from City Water Mains to Sprinkler Systems and Standpipes," by F. A. Raymond, engineer, National Board of Fire Underwriters, New York City; "Motor vs. Horse Drawn Apparatus in Heavy Snows," by James Smart, chief, Calgary, Can.; "The Efficiency of the Motor Pumping Engine," by George W. Booth, chief engineer, National Board of Fire Underwriters, New York City; "A Review of the Association Work for the Past Ten Years," by Howard L. Stanton, chief, Norwich, Conn.

KNOX FOR COUNTRY DISTRICT.

Combination Vehicle Recently Placed in Service in South Attleboro, Mass.

An accompanying illustration shows the Knox combination chemical and hose wagon, recently acquired by the department in Attleboro, Mass., for the station in South Attleboro. This district is about 4.5 miles from the centre of the town, and the volunteer company is called upon to cover a wide radius, largely composed of country and suburban residences. But two permanent men are employed, and one of these will operate the new car.

The machine is made by the Knox Automobile Company, Springfield, Mass., and is a stock model in every respect, equipped with a 48 horsepower motor, Perkins self-lighting system, 30-gallon chemical tank, 200 feet of chemical hose, 1200 feet of regulation fire hose, two 18-foot extension ladders, axes, pike poles, lanterns, etc. In practically every respect it is a duplicate of the combination wagon which has given exceptional service in the central station at Attleboro during the past year.

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WHITE PROTECTIVE WAGON.

Boston's Experience Indicates That Service Is Much Superior to Horses.

The city of Boston maintains what is known as a protective department, which is in reality a part of the fire department and is so recognized insofar as legal provisions are concerned, although the various insurance concerns are assessed in proportion to the amount of premium returned. This force is supplied with suitable apparatus for saving life and property at or after a fire.

The White car, made by the White Company, Cleveland, O., and shown in an accompanying illustration, has been in this service for some time past, taking the place of horse drawn equipment. It carries extension ladders and tarpaulin covers, the latter being utilized to protect merchandise from water. Inasmuch as the section served by the car is extensive it has developed that not only can the machine carry a much larger load, but can be depended upon to arrive at the scene of the fire in quicker time, thereby indicating an efficiency over horses, which cannot be reduced to dollars and cents.

EXPERIENCE OF PASSAIC.

Saving in Maintenance Cost Sufficient to Purchase New Machine Each Year.

Chief R. H. Bowker of the fire department in Passaic, N. J., in reply to a letter from Chief Charles N. Hogg of Binghamton, N. Y., states that the city now has 11 pieces of motor apparatus, two of which are tractors. Last winter was most severe, the horses experiencing difficulty in travelling through the heavy snow, although the automobiles were able to answer all alarms.

At the beginning of the year, Passaic had 27 horses in this service, which cost $6800 for feed and shoeing. Today there is not a single horse in the department, and the cost of maintaining the motor equipment does not exceed $1200 a year. Chief Bowker asserts that the saving effected between horses and motors is sufficient to enable the purchase of one piece of automobile apparatus each year.

BOND ISSUE ASSURED.

Pittsburg Plans to Expend $700,000 for Fire Apparatus and Police Patrols.

At the coming election in November the voters of Pittsburg, Penn., will be asked to authorize the sale of $5,000,000 in bonds for various improvements, $700,000 of which is to be expended in the purchase of automobile fire apparatus and police patrols. Practically no opposition is manifested toward the proposition, and the bond issue seems assured.

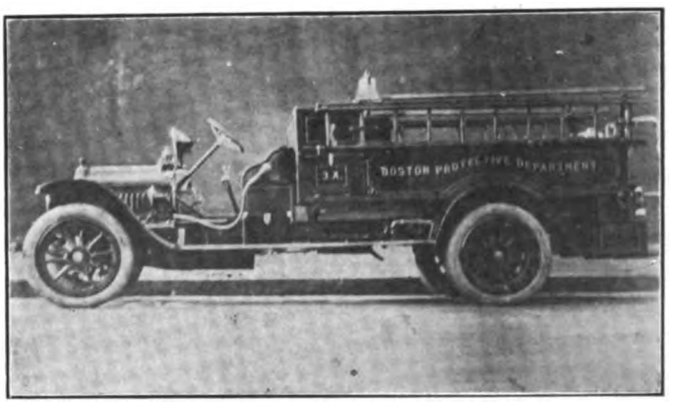
Public Safety Director John M. Morin has suggested a contingent fund of $20,000 for motor driven police wagons, and there are now being delivered seven of these vehicles. An effort will be made to increase this number to 12 before winter. This will carry out the plan of putting the entire police patrol system of the city on a horseless basis.

FIGURES INDICATE ECONOMY.

Two Cities in New York State Find Motors Reduce Maintenance Cost Appreciably.

Chief Mulcahy of the fire department in Yonkers, N. Y., states that during five months the cost of maintenance on one of its motor vehicles was $353.90, as compared with $410.28 for horse drawn equipment of a similar nature. The automobile responded to 122 alarms, travelling 254 miles, while the horses answered 80 alarms and covered less than 90 miles.

Chief E. J. Shadwick of the department in Saratoga, N. Y., also presents interesting figures. For 12 months his motor vehicle cost $28.76 to maintain, whereas the



White Truck Fitted as Protective Wagon and in Service with Boston Department.

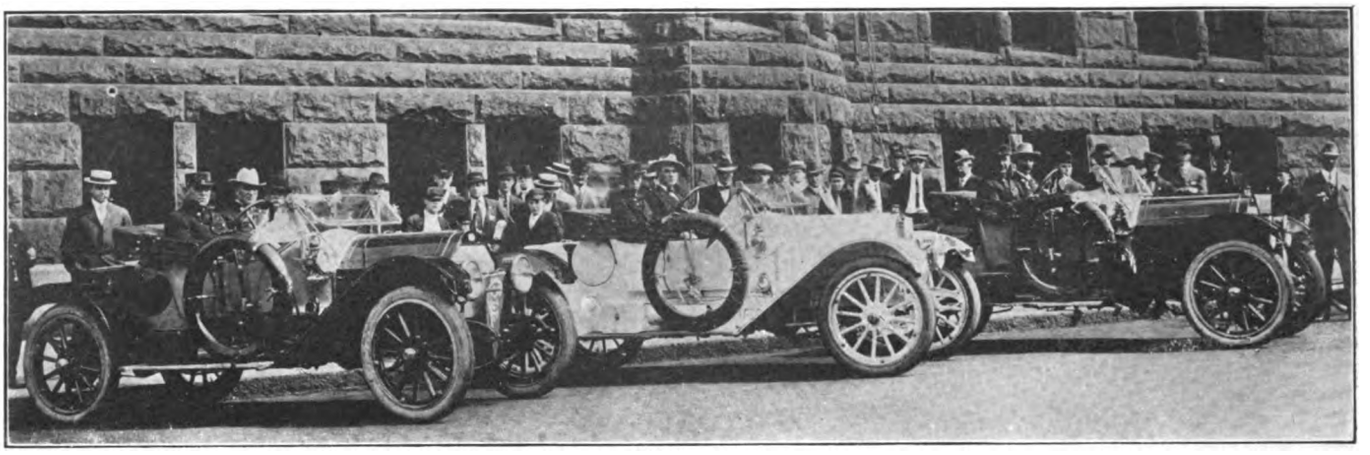
horse drawn apparatus in the same house cost $590.22 for the same period. In the latter instance the salary of another man, $780, must be added. A new team was purchased at a cost of $200, which brings the total maintenance charge for the horses to $1570.22.

WEBB COMPANY REORGANIZED.

Factory to Be Removed to Allentown, Penn., and Line Will Be Increased.

John M. Mack, Allentown, Penn., it is reported, has secured control of the Webb Motor Fire Apparatus Company of St. Louis, Mo., which will in future be known as the Webb Company, with sales office in New York City, where Milton B. Strauss will be located as sales manager in the United States Rubber building, Broadway and 58th street. The Webb plant will be removed from St. Louis to Allentown, where the $250,000 plant of the Allentown Machine & Foundry Company has been secured. Some changes, it is

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Three Cole Roadsters Employed by the District Chiefs in the Fire Department at Minneapolis, Minn.

stated, will be made in the Webb line.

The Webb Company has been completely reorganized with the advent of Mr. Mack. He was one of the founders of Mack Bros. Motor Car Company, maker of the Mack line of trucks, now included in the product of the International Motor Company, which also has the Hewitt and Saurer lines. He recently resigned as vice president of the latter company to form a $600,000 corporation to take over the Webb interests. The office of the concern will be at Allentown, Penn., while a branch factory will be maintained at St. Louis. Distributing branches will be operated at New York, Boston, Philadelphia, Atlanta, Ga., Cleveland, O., Chicago, St. Louis, Kansas City, Dallas, Tex., Vancouver, B. C., Halifax, N. S., Portsmouth, O., Los Angeles, Cal., San Francisco, Cal., Winnipeg, Can., Spokane, Wash.

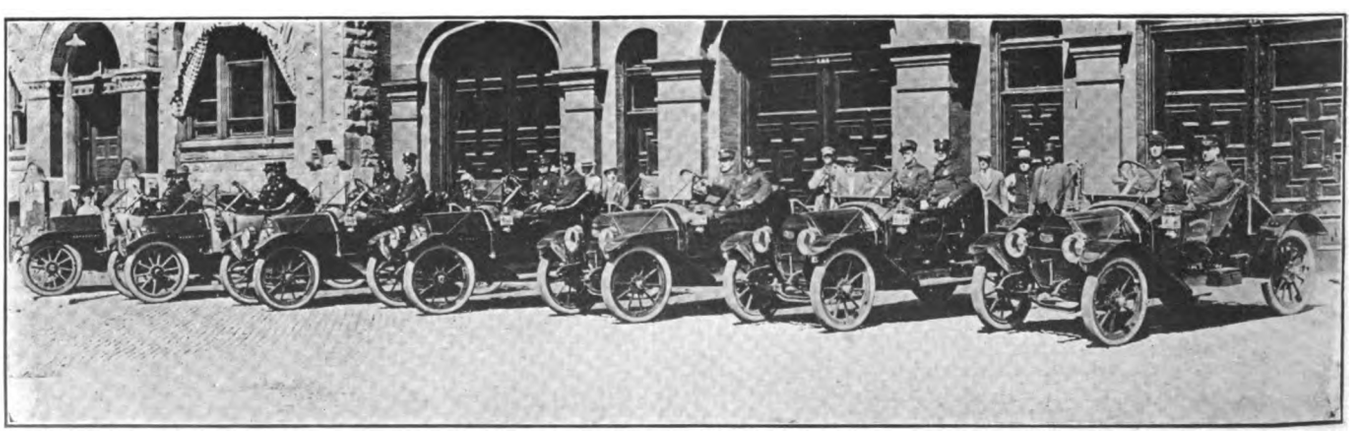
BRIEF ITEMS OF INTEREST.

Manufacturers Should Be Assisted—Chief John Kenlon of the New York City fire department, who has made a thorough study of modern fire fighting apparatus, makes an excellent plea for the manufacturer of gasoline pumping engines. He delares that it is the duty of all fire department officials to assist in developing this phase of the situation, by placing the product in service, so that eventually the perfect type of engine will be evolved, just as the steam fire engine was perfected through actual use in fire fighting.

Cartercars in Milwaukee—As is more or less well known fire department officials in several cities throughout the country have been utilizing friction driven Cartercars, made by the Cartercar Company, Pontiac, Mich., with splendid success. An accompanying illustration presents the seven new machines of this make recently installed in the department at Milwaukee, Wis. The picture was taken in front of the department headquarters and Milwaukee's famous jail is shown at the left.

Cole Roadsters for Fire Service—Three of the fire chiefs in Minneapolis, Minn., recently took possession of 1912 Cole roadsters, made by the Cole Motor Car Company, Indianapolis, Ind., and shown in an accompanying illustration. The sale was made through the agency of Harvey Haynes of the Haynes Knutson Auto Company, Minneapolis, northwestern distributor for Cole cars. Mr. Haynes is shown at the extreme right of the picture. In the cars, from left to right are: District Chief Edwin Theilen, Assistant Chief E. E. Caldwell and District Chief John Anderson. The Minneapolis department now has 12 pieces of motor apparatus.

Bulletin for City Officials—The American-La-France Fire Engine Company, Elmira, N. Y., which is actively engaged in the manufacture of several types of motor driven fire machines, has inaugurated a series of monthly bulletins in which valuable hints are given



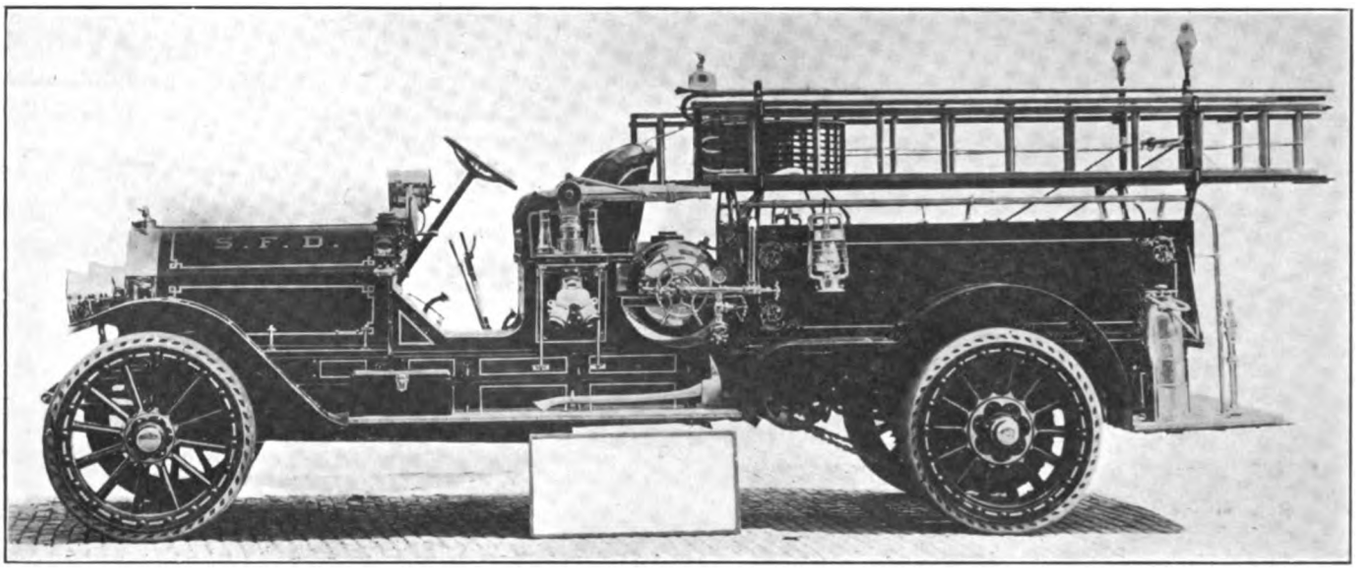
Seven Cartercars Recently Placed in Service with the Fire Department at Milwaukee, Wis., in Front of the Headquarters.

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to city officials contemplating the purchase of such equipment.

KisselKar Proves Satisfactory—Salina, Kan., is said to be the only city in the country anywhere near its size which can boast of a complete equipment of motor vehicles in its fire department. The last horse in the Salina service was sold last month, when the KisselKar shown herein was officially accepted. That the product of the Kissel Motor Car Company, Hartford, Wis., is proving efficient in this class of service, is borne out by the fact that wherever it has been given a trial it has demonstrated satisfactory speed. On the first run at Salina the truck covered a little over a mile in 2:01.

Pittsfield Orders Aerial Truck—The fire department committee of Pittsfield, Mass., has given an order for a new motor aerial truck to the American La France Fire Engine Company, Elmira, N. Y. The machine will cost $11,000 and is to be delivered on or before Nov. 15.



KisselKar Combination Wagon Which Recently Replaced the Last Horse Drawn Equipment in Salina, Kan.

Motor Police Patrol at Binghamton—A new motor driven police patrol wagon, made by the Packard Motor Car Company, Detroit, has been accepted by Binghamton, N. Y., the officials of which city are pleased with the efficiency of the wagon as shown in the tests.

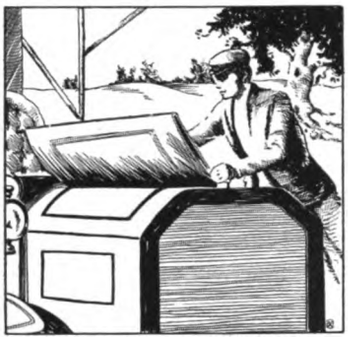
Waterloo Likes Seagrave Cars—The Waterloo, Ia., fire department has placed an order for another Seagrave motor combination chemical and hose car, made by the Seagrave Company, Columbus, O.

In the Market—Following are some of the cities which have under consideration the purchase of motor driven fire apparatus: Cleveland, O., appropriation of $4600 for purchase of auto patrol wagon; Monroe, Wis.; Sacramento, Cal.; Wallingford, Conn.; Racine, Wis.; Spencer, Mass., to ask appropriation for purchase of motor combination hose and chemical car; Portland, Ore., investigating motor apparatus in other cities with view to purchase; Pittsfield, Mass., insurance engineers recommend purchase of motor car for chief and a motor combination hose and chemical car for general service; St. Joseph, Mo.; Dubuque, Ia., committee to investigate motor fire apparatus is being formed; Champaign, Ill.; Alameda, Cal.; Chelsea, Mass., money has been voted for purchase of combination chemical and hose car; New Orleans, La.; Clarksdale, Miss., inspecting apparatus with view to purchase of combination chemical and hose car; Glendale, Cal., seeking bond issue to build fire station and equip it with motor fire fighting machines; Dallas, Tex., building $15,000 fire station, to be equipped with automobile fire fighting apparatus; Jersey City, N. J., an appropriation of $41,300 is to be asked for the purchase of four combination wagons, one 75-foot motor aerial truck, two motor triple combination cars, one car for the telegraph department and one chassis for No. 19 engine; Lynn, Mass., bonds of $28,000 have been issued for purchase of motor equipment; Bakersfield, Cal., an issue of $60,000 in bonds for motor equipment of fire department; Wundber, Penn.; Fresno, Cal.; Wilmington, Del.; Grinnell, Ia.; East Liverpool, O.

Springfield Adds Lifesaving Car—A lifesaving car, similar to the Knox car previously installed, has been added to the automobile fire equipment in Springfield, Mass. The new machine is built on a 50 horsepower Knox chassis and is distinguished by a strong curved bumper extending across the front of the car and affording protection to the radiator, engine, headlights and front wheels in case of collision. In addition to all manner of lifesaving apparatus, provision is made for a good sized squad of men.

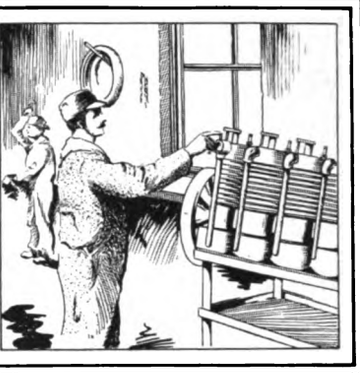
Motor Ambulances—The city council of Des Moines, Ia., has authorized the purchase of a motor combination ambulance and patrol wagon,

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AINTS·FOR·PROPER MAINTENANCE

A Department for the Owner, Driver and Repairman.



BYPASS DEVICE FOR CARBURETORS.

With some types of carburetors it is a difficult matter to secure a satisfactory adjustment at both high and low speeds; that is, the vaporizer may be so set that the moter will throttle down nicely at low speed, but when the lever is moved wide open or nearly so, the mixture will be such that the efficiency of the power plant is greatly reduced.

While the carburetor on the commercial vehicle is not subjected to the variable demands noticeable with the pleasure automobile, a flexible motor is desired. This requires a carburetor which will permit the engine to be throttled down very slowly as many drivers make it a practise to run the motor when it should be stopped. Another important factor is easy starting.

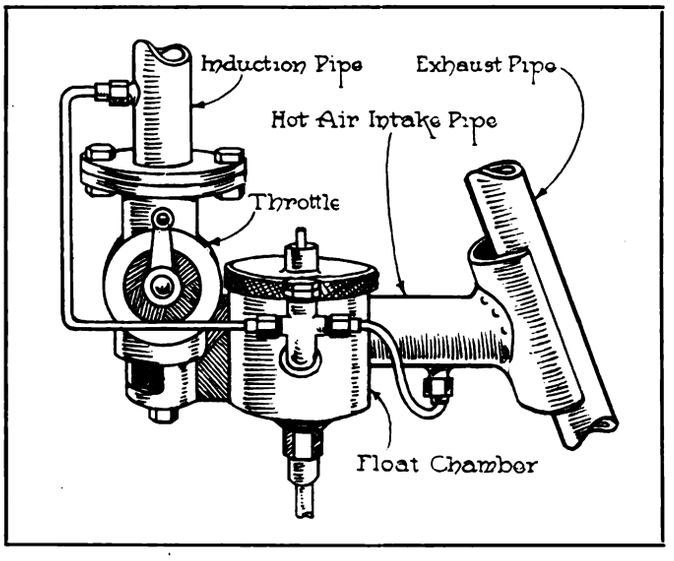


Fig. 1—Bypass Device for Attachment, to Float Chamber of Carburetor, Designed for Easy Starting of Motor, Etc.

An English engineer placed upon the market recently a new form of bypass attachment to the carburetor and it is claimed that it improves the slow running qualities of a motor as well as provides a proper mixture when the throttle is closed. In addition, it is stated that the flexibility of the motor is increased by its use.

The bypass is depicted at Fig. 1 and it will be noted that it takes the form of a small jet chamber, screwed into the float chamber of the carburetor, whence it takes its supply of fuel. Over the gasoline jet of the bypass is an adjustable set screw provided with a lock nut. By means of this screw the mixture can be changed until the desired result is obtained. The air passing over this jet is taken from the main hot air intake pipe of the carburetor through a small bore copper pipe connected by suitable unions. A similar pipe leads from the bypass to the induction pipe at a point above the throttle equi-distant from all cylinders. Thus when the throttle is closed the vacuum in the induction pipe causes a rich mixture to pass to the motor from the bypass, this amount being such as to permit the engine to turn over slowly.

Similarly when the throttle is in any other position than fully open the partial vacuum in the induction pipe draws a small quantity of gas from the supplementary supply, this tending, it is claimed, to keep the strength of the mixture constant and correct at a time when it naturally tends towards weakness. It is also pointed out that starting is made easy because of the adjustable features of the bypass device.

INCREASING SIZE OF REAMER.

To increase a worn reamer's size, polish the face of each tooth with a hardened burnisher, which can be made from a three-cornered file rounded off on the corners. This will increase the size from two to 10 thousandths. The reamer is then honed back to the required size. To make a tap or reamer cut larger than itself, place waste in a flute, just enough to crowd it over so it will cut on one side only. In sizes of 1.5 inches or larger, put a strip of tin on one side and let it follow the tap through.

REPLACING WORN SPRING BOXES.

The spring boxes on the rear axles of some types of cars wear so badly during the season that they become loose on the tube, rattle and jump on rough roads. This is especially true where the members are of one piece, and to obviate this trouble a number of machines are being equipped with divided boxes. so that they may be adjusted for wear.

A repair may be effected in the following manner: Remove the worn members from the axle by cutting them in pieces with a hacksaw. Next true up and smooth the axle with a file. Patterns are then made

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for a new set twice the width of the original, and in two sections. Malleable iron castings are made from these, after which the flat surfaces are planed, four

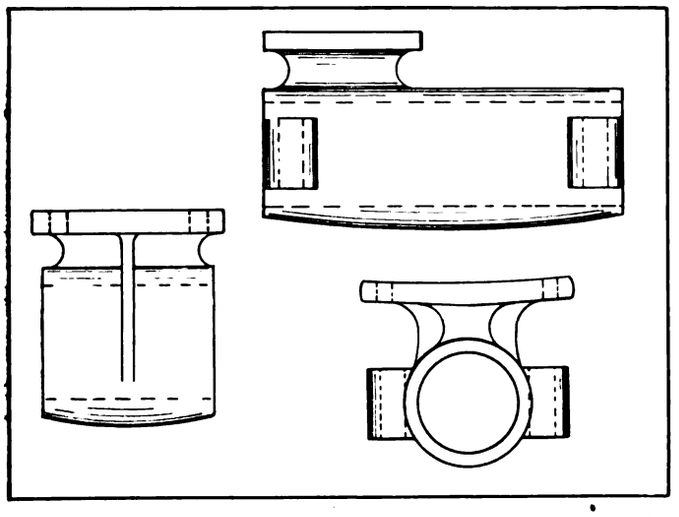


Fig. 2—Method of Replacing Worn Spring Boxes on Rear Axles by Making Patterns for Malleable Iron Castings.

holes drilled for the clamping bolts and the two halves bolted together as shown at Fig. 2. The box is then chucked in the lathe and the hole bored to fit the axle.

UTILIZING GIRDERS FOR SHELF.

It is surprising how much old material collects in the garage and repair shop and when the building is of concrete or cement, it is more or less difficult to arrange shelves for the storage of old lamps, seats, etc. At Fig. 3 is presented a method utilized by the proprietor of a repair shop for fitting shelves to the iron girders. A piece of flat iron of suitable thickness was bent in hook form to clasp the projection of the beam, and the lower end of the metal bent at right angles for the purpose of securing the boards, as depicted in the drawing.

Another piece of iron was forged to the shape of the projection of the girder and was drilled to take a bolt which was also passed through the main member and locked with a nut. Four hangers were employed and to these were secured the shelves. As there was much space between the beams, the shelf provided means for storing considerable old material.

PLANETARY TRANSMISSION TIPS.

The planetary transmission is simple and easy to operate, but requires care. While this type seldom gives trouble other than readjusting or relining the bands, the high speed plate will slip at times and when this occurs the member must be taken up.

In adjusting the part the lock nut is loosened and the collar turned clockwise. Before locking the part, the hand or operating lever should be worked to see if the speed locks easily. If after this the clutch still slips, and further adjustments do not bring about the desired results, and considerable strength is required to lock the lever in position, it is well to examine the high speed plate and note if it be not cracked. Sometimes these members will split, especially if subjected to considerable play in the end thrust bearings, and when locked the plate will spread, failing to grip properly. It is difficult to repair these members and the easiest and cheapest way is to purchase a new one. Before fitting the new part look for end play of the driving shaft and if any exist, readjust bearings, as the new plate will be likely to break as did the old part.

If upon setting the high or low speeds, they hold properly when being utilized, they should be tested to note if they are dragging. This may be accomplished with the motor idle, clutch out and the brakes released. If upon cranking the motor the machine has a tendency to roll forward, the bands should be examined to see if they are gripping too harshly. It may be that the lining has become worn and that the material does not make a good contact except in one or two places of the circle.

When these conditions exist the friction set up will heat the casing unduly and if the transmission be worn, the lubricant will melt and run out. Sometimes the springs holding the bands open when not in use, lose their elasticity. The latter should not press against the metal and if adjusted properly will contact sufficiently to perform their work and at the same time will not produce undue friction.

CARVER PORTABLE DRILL.

There are many places about the chassis of the motor car which must be drilled to fit special appliances and it is not always convenient to remove the part and carry it to the bench. Sometimes it is difficult to operate a hand or breast drill, owing to lack of room in which to rotate the handle. The portable electric drill overcomes these difficulties and in addition much valuable time is saved to the customer as well as the shop.

The American Electric Tool Company, West Newton, Mass., is manufacturing what is known as the type 3-A. C. Carver portable electric drill, presented at Fig. 4. It is a two-speed instrument, providing 350 or 650

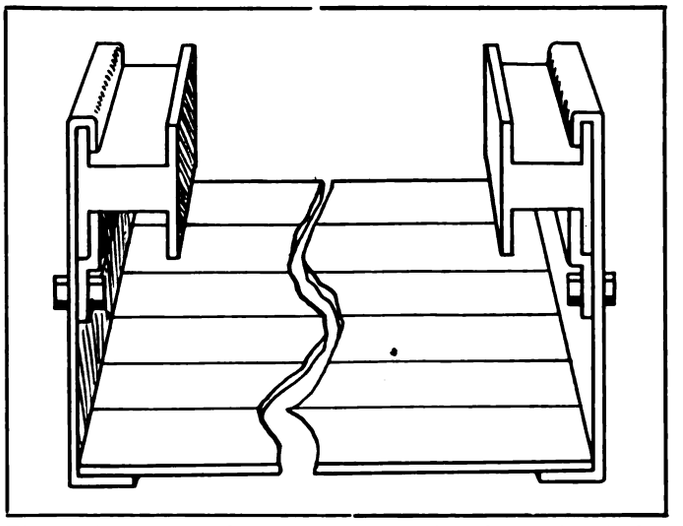


Fig. 3—Suggestion of Utilizing Girders for Shelves by Fitting Hangers to Which Boards Are Fastened.

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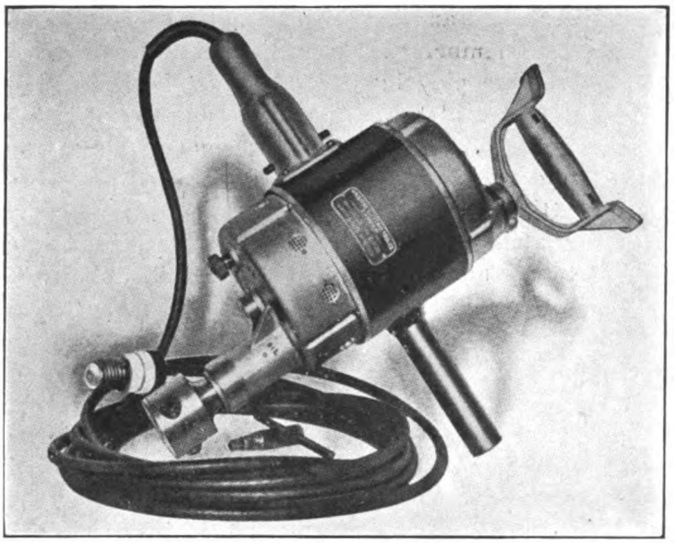


Fig. 4—The Carver Portable Electric Drill Having Two Speeds, Combination Breast Plate and Spade Handle.

revolutions a minute as desired and is capable of drilling steel up to and including .5 inch. It is very compact and weighs but 23 pounds and comes equipped with 20 feet of best flexible water proof cable, 16 gauge, and separable socket attachment plug for connecting to any lamp socket.

The motor is especially designed to produce maximum power with least weight, and the armature rotates in imported ball bearings. The gears are of high grade steel and Parsons bronze, and by means of a thumb nut on the front head the speed can be changed while running. A ball thrust bearing protected by a dust cap, reduces wear and friction to a minimum. The motor is air-cooled by forced circulation and the air apertures are covered with perforated metal to prevent the entrance of metal chips. The spindle bearings are of the best hard bronze, and it is pointed out by the maker that the drill requires no other attention than oiling.

Each member is equipped with a combination breast plate and spade handle, permitting of use in any desired position, and a No. 1 Morse taper socket instead of chuck is optional. Instant control is obtained by a quick break switch in one of the side handles. The other member unscrews. The chuck is off centre, allowing the drill to be utilized in a corner.

VICTOR PORTABLE TIRE INFLATOR.

In order to render quick and efficient service to its patrons the garage should be equipped with means other than the manually operated pump for inflating tires. While tanks of compressed air are largely utilized, this system has the disadvantage of not being portable; that is, the automobile must be moved in proximity to the hose.

The Victor Electric Company, Chicago, has brought out a portable tire inflator which is a combination air compressor, electric motor and pressure gauge as a unit, and among the commendable features is that the device may be utilized for removing the dust which lodges in the crevices of tufted cushions and other places difficult of access by other means. Being mounted on wheels it is moved easily about the garage and may be employed at any point convenient to a lamp socket of the lighting system.

Special attention has been paid to the compressor and its construction embodies high grade material and workmanship. The inlet and outlet valves are of the steel ball type, and are readily adjusted. The cylinder is of steel and its piston is equipped with a patented lubricating device. This consists of a felt ring set into a groove provided near the centre of the piston head and after once being oiled keeps the cylinder well lubricated as well as prevents any surplus oil from collecting and being forced to the inner tube of the tire.

The gauge indicating the pressure is connected to a small reservoir through which all the air must pass on its way to the tire and a drain cock is fitted to this compartment. It has two functions, one making it possible to reduce the tire presssure or to allow all of the air to escape, the other to permit the drawing off of any moisture, foreign elements, etc., that may collect. The deposits are expelled through the drain cock by connecting the outlet hose and pumping up a pressure of approximately 75 pounds before the vent member is opened. As but one-fifth horsepower is required to operate the device, and as it is only in service during the inflating process, the maker points out that it is very economical as well as convenient. Drive from the motor to the inflator is by belt and the reduction is such that a small amount of current is utilized after starting. The pump is actuated by an eccentric.

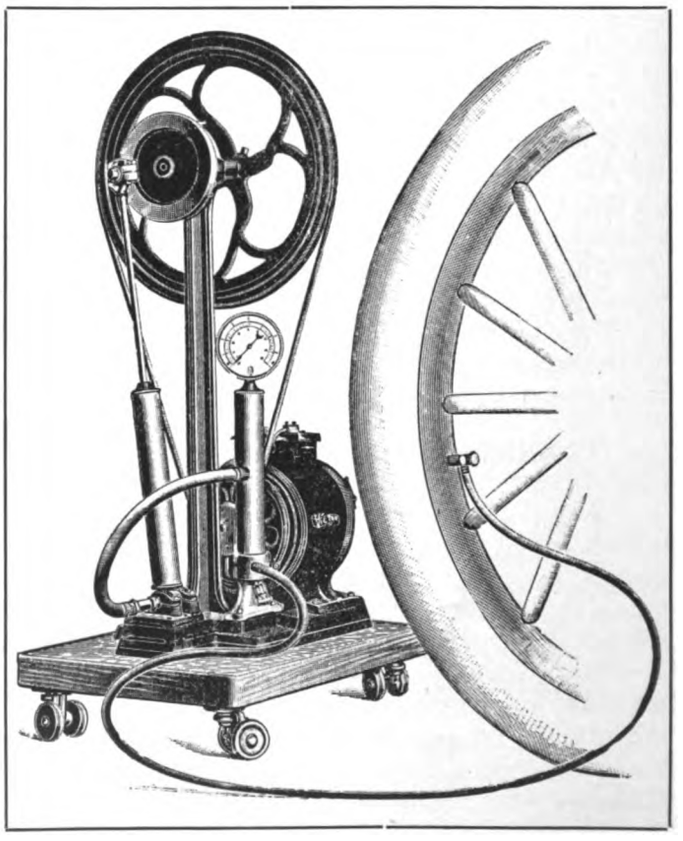


Fig. 5—The Victor Portable Tire Inflator, Actuated by Electric Motor and Making for Convenience.

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CORRESPONDENCE.

Pitch of Gears and Measuring Devices.

(11)—I notice reference made to diametral and circular pitch, also to fine measurements to which gears are subjected. Will you explain the meaning of the pitch terms, also what is a vernier? CONSTANT READER.
Lima, O., Aug. 15.

In the cutting of gears, diameter is always understood to mean the pitch diameter. Diametral pitch is the number of teeth to each inch of the pitch diameter. For example: If a gear has 40 teeth and the pitch diameter is four inches, there are 10 teeth to each inch of the pitch diameter and the diametral pitch is 10, or, in other words, the gear is 10 diametral pitch.

Circular pitch is the distance from the centre of one tooth to the centre of the next, measured along the pitch line. For example: If the distance from the centre of one tooth to the centre of the next, measured along the pitch circle, is .5 inch, the gear is .5-inch circular pitch.

For facilitating the measurement of wheels to be sized according to diametral pitch, either Brown & Sharpe No. 61 or 78 steel rules are utilized. The former is a 12-inch member containing four lines of graduations upon each side, each one as follows: 18ths, 22nds, 24ths, 26ths, 28ths, 30ths and 32nds. Each line of graduations is figured the whole length of the rule, 10, 20, 30, etc. If a wheel of 60 teeth of 20 pitch is to be sized, 60 is located on the line of 20ths and that is the pitch diameter of the required wheel. Two of the divisions are added to make the outside diameter which is 62 20ths.

The No. 78 rule is a 12-inch member having one inch only of graduations on each end as follows: 6ths, 7ths, 8ths, 9ths, 10ths, 11ths, 12ths, 14ths, 16ths, 18ths, 20ths, 22nds, 24ths, 26ths, 28ths, 30ths, 32nds, 34ths, 36ths, 38ths. The intermediate 10 inches are blank, except that the inch lines are made clear across the rule.

Suppose a wheel of 83 teeth of 10 pitch is to be sized. Take eight of the blank inches and three of the 10ths graduations, which gives the pitch diameter of the required wheel. Add two of the 10ths, which gives the outside diameter or 8.5 inches.

The vernier is a device for reading finer divisions on a scale than those by which the scale is divided. Sixty-fourths are about the finest divisions that can be read accurately by the naked eye. When fine work is necessary, the vernier is employed.

One division of the vernier is equal to .9 of one division on the true scale, consequently the difference equals .1 of the true division or when each of these is one inch, .1 inch. The difference at the second divisoin is .02, at the third, .03, and so on. If the vernier be moved until the third division coincides, it will have moved .03 inch. It is this principle that is applied to measuring instruments.

When graduated to read in thousandths, the true scale is divided into 50 parts to the inch and the vernier graduated into 20 parts, each division of the vernier being equal to nineteen-twentieths of one on the true scale. If the vernier be moved so that the lines at the first division coincide, it will have moved one-twentieth of one-fiftieth, or .001 inch. At Fig. 6 is depicted the application of the device, showing the method of measuring a sprocket tooth. The insert presents the fine divisions, somewhat enlarged.

Tungsten Steel and Magnets.

(12)—What is tungsten steel and why do magneto makers advertise their magnets made of this metal? Is it superior to regular steel such as chrome nickel and is it a combination of alloys or a metal by itself? D. A. MAKINNEY.
Dallas, Tex., Aug. 25.

Tungsten as a chemical is a rare element of the chromium group found combined in certain minerals, as wolframite and scheelite, and isolated as a hard, brittle, white or gray metal melting at 2000 degrees centigrade and having a specific gravity of 16.6-19; called also wolfram.

As a metal, steel containing a small amount of tungsten is noted for tenacity and hardness, even under a considerable degree of heat. It often contains manganese. It is utilized for magnets, since it retains its magnetism longer than ordinary steel. By incorporating simultaneously carbon and tungsten in iron, it is possible to obtain a much harder steel than with carbon alone, without danger of an extraordinary brittleness in the cold metal or an increased difficulty in the working of the heated metal.

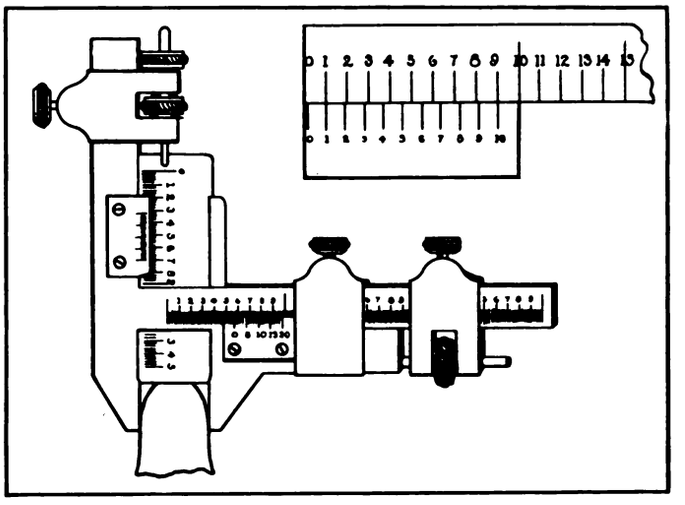


Fig. 6—Fine Measuring Devices: A, Micrometer Tooth Instrument; B, Vernier for Reading Fine Divisions.

SPEEDWELL SHOWS EFFICIENCY.

A Speedwell four-ton truck recently gave a good demonstration of efficiency in San Francisco, Cal. The L. J. Hopkins Company had a very large shipment of fresh fruit to be delivered to one of the Pacific steamers, which had to be loaded onto the steamer sailing the day the order was received. The Hopkins company called the Speedwell Motor Car Company's agency 45 minutes before sailing time and stated that it had 13,000 pounds of fruit to be moved at once. A four-ton truck was assigned to the work. Although heavily overloaded the motor vehicle performed the work for which it was called with little difficulty.

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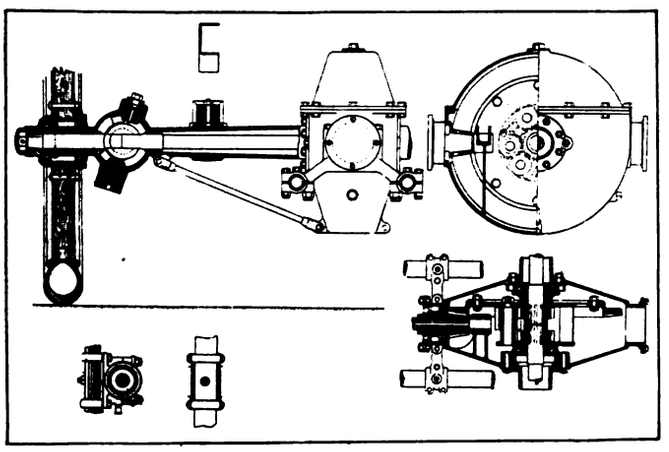
FOREIGN TRUCK NOTES OF INTEREST

BRITISH FRONT DRIVE PILGRIM.

An Entirely New Design Which Is Regarded as Promising for Vehicles of the Light Delivery Type.

Pilgrims' Way Motor Company, Ltd., Farnham, Surrey, England, has produced a light delivery wagon with front drive, which is creating not a little favorable comment throughout the British Isles. The Pilgrim is by no means the first front driven machine brought out abroad, and the designs are considered as having demonstrated their value in numerous installations. There are some features connected with this car, which are distinctive, and which have caused automobile engineers in Great Britain to suggest that it has decided promise in its particular field.

The motor is a two-cylinder, horizontal opposed unit with bore of 3.85 inches and stroke of four, giving a rating of 11.8 horsepower. This and the gearbox are supported on a tubular steel sub-frame, slung from



Outlining Front Drive Arrangement as Applied to Pilgrim Light Delivery Wagon.

two longitudinal frame members at the rear and attached to the differential casing at the front. Ignition is by Bosch dual high-tension magneto, and the carburetor is of the White & Poppe design. Lubrication is by a combination pump and gravity feed system, whereby the oil is pumped into channels near the top of the crankcase, whence it flows downward through various ducts to the crankshaft and bearings and thence to the sump. Cooling is by water, circulation being by centrifugal pump.

The drive is transmitted through a metal-to-metal cone clutch, located in front of the engine, to a three-speed transmission. A short cardan shaft connects the gears to the differential, which gives a gear reduction of seven to one. As shown in an accompanying line drawing, the differential casing is bolted between the tubular casings enclosing the front driving axles. The cage for the differential gearing is cast in one piece, and by the removal of the top half and the withdrawal of the castellated axle shafts, the whole of the differential gear may be removed without detaching the axle casing from the chassis.

The drive from the differential to the road wheels is taken through a universal joint of somewhat unusual design, the forks of the driving shafts and driven stub axles being held in engagement with recessed balls. The ball joints of the driving axles are contained in corresponding ball and socket joints on the axle casing, the joints of the latter being brought as closely to the wheels as is possible in order to contribute toward easy steering.

Foot and hand brakes are arranged to operate in the usual manner, the latter acting internally on the rear wheel drums and the former on a drum carried on the cardan shaft between the gearbox and differential. The steering gear is of the worm and gear type, and it is claimed that a turning radius of 14 feet is obtainable with the wheels in full lock. Sankey pressed steel road wheels are carried on ball bearings, and it is intended that the chassis shall be equipped with pneumatic tires. The wheelbase is 90 inches and the tread 52. The carrying capacity is .75 ton.

G. M. C.'S IN CHINA.

Municipalities Adopting Trucks with Dumping Bodies for Garbage Collections.

That China is ahead of even the United States in some respects in the use of motor driven vehicles, is the opinion of Gleeson Murphy, vice president of the General Motors Company, Detroit, maker of G. M. C. gasoline and electric trucks. In an interview recently regarding the use to which several cities in that country had put the mechanical transport he had the following to say:

"China may have waited 4000 years to awaken from its slumbers, but now that this nation is up and doing, it has actually eclipsed us in one or two things. This is really a remarkable tribute to the people of this nation, and proves that these easterners are better able to see the advantages of modern utilities than the people of our own country. In China a number of cities are using motor trucks equipped with dumping bodies for the removal of garbage. In this respect they are ahead of our own country, and the question naturally arises as to why our municipalities have not been eager to adopt the motor truck for the same purpose. The use of trucks would not only aid in the proper sanitation of cities, but would, without question, prove more efficient than the old method."

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FOREIGN FIRE EQUIPMENT.

Observations of Brockton Engineer While on an Extended Tour Through Europe.

Engineer John Shaw of the Brockton, Mass., fire department, who recently completed a tour of six weeks in Europe, has some interesting things to say relative to the automobile equipment and motor driven fire apparatus in use in all the big cities of Great Britain, France, Belgium and Holland. During his stay abroad he visited fire stations at London, Liverpool, Manchester, Birmingham and Southampton, in England; Glasgow, in Scotland; Dublin and Belfast, in Ireland; Paris and Versailles, in France; Antwerp and Brussels, in Belgium; Rotterdam, Amsterdam and other places, in Holland.

"Automobile equipment and motor driven apparatus is the rule of the fire departments in the cities I visited," says Mr. Shaw. "They rather lead the American cities in this respect, but their machines are much lighter than those used in this country and each delivers hardly more than 350 gallons of water through .625-inch nozzles. The automobiles over there carry motors to pump the water, as well as to supply energy to the vehicle. One thing they use quite extensively is the portable fire escape. It is something on the principle of our extension ladders, a telescope scheme, where section after section is shot up to a height of 55 to 90 feet. Some of the fire automobiles carry one of these portable escapes, with a gig on wheels at the base and this gig can be dropped off the machine and wheeled into place as the condition may require.

"Another scheme they have is an air pump wagon, with which numerous air tubes connect to smoke helmets. The firemen don these helmets and carry their air tubes with them, something after the fashion of the deep sea diver. I do not know how the scheme works under various conditions, but they use them in places where we would have to take the hardest kind of punishment."

TRAVELLING SURGICAL LABORATORY.

Equipment That Is Complete in Every Detail for Taking Care of Wounded in Time of War.

Europe has given decidedly more attention to the subject of utilizing the motor vehicle for military purposes than has been true in this country. This applies particularly to France, although Germany is not far behind in this regard. Seemingly there has been no field of operation to which the French inventor has not devoted his energy. Accompanying illustrations present the Boulant surgical automobile, which is in every way a modern operating room, equipped with all the accessories and fittings to make it the last word in scientific perfection.

The chassis is a Schneider, redesigned to accommodate the width and length of body which has been deemed necessary to fulfill the demands of a vehicle of this character. The motor is a 40 horsepower Schneider, and is guaranteed to propell the car to the scene of activities in the time of war at a speed of 30 kilometers (about 18 miles) an hour.

While it is contemplated that the vehicle may be utilized to accompany the troops into engagement, it has provision for establishing a permanent camp within easy access of the conflict, a tent being folded against either side. One of the photographs presents the car thus stationed with the tent set up, and it is anticipated that this would be utilized as a reception room for patients, either before or after treatment.



Boulant Travelling Surgical Laboratory, Mounted on Schneider Chassis for Use in Times of War.

The car itself is divided into three compartments, the main portion being the operating room. This is fitted with all necessary appliances, and is quite as complete in its appointments as any hospital. One of the views shows this room, with its operating table, washstand, etc., this being that looking toward the front of the machine, and the electrical apparatus in the forward compartment may be seen through the doorway.

Here also is located the sterilizing plant, by means of which sterilized water is obtained for use in the operating room, and in addition it is possible to supply the troops with 15,000 liters of such water every 24 hours. An electric pump is provided for the purpose

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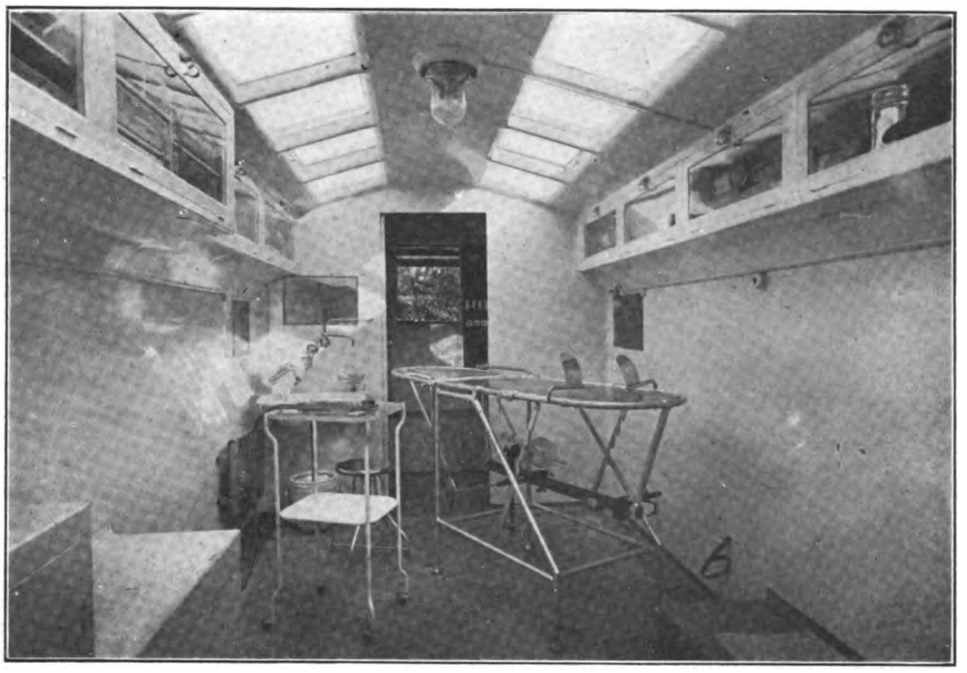
of taking the water from a well, pond or stream, the energy being supplied by the motor of the automobile. The sterilizing process is by means of ultra-violet rays.

The rear compartment houses the radium apparatus, and a special device, invented by M. Boulant, permits the use of the radioscope at the operating table. Here also are cupboards and drawers for the reserve surgical materials.

The vehicle was given its preliminary tests under conditions approaching actual service, during the war office trials at Versailles, last month. Other apparatus included automobile ambulances, designed to carry from two to four patients at a time. However, greatest interest naturally centres upon the Boulant car.

GENERAL NEWS FROM ABROAD.

British 'Bus Service—The London General Omnibus Company, Ltd., in combination with the Tube Railways, has just inaugurated a service of 'buses from Hounslow to the royal borough of Windsor. Printed time tables have been issued and a half-hourly schedule is maintained. The service has become popular and on Sundays and holidays it has been impossible to meet the demands of the travelling public on some occasions.



Interior of Boulant Vehicle, Showing Operating Table, and a Glimpse of the Electrical Apparatus in Forward Compartment.

American Tractors in Russia—A recent trial of a 45 horsepower American tractor with eight furrow plows, was made on the estate of Count Xavery Branicki, at Wilanow, six miles from Warsaw, Russia. The test created decided interest among farmers, who went from all parts of the country to witness it. Plows being worked with horses were forced to abandon the task on account of the heavy state of the ground, due to recent rains, but the tractors performed their work easily. One agriculturist, who has experimented with tractors, stated that he foresaw a good future for the American manufacturer in Poland, where hand labor is becoming costlier and scarcer year by year.

Federal Truck to Japan—Futabaya & Co., of Japan, large exporter and importer, after thoroughly investigating American trucks, negotiated with M. L. Pulcher, general manager of the Federal Motor Truck Company, Detroit, Mich., for the purchase of a one-ton Federal, which has been shipped to the Japanese concern. Mr. Pulcher pointed out the superior qualities and simplicity of the Federal commercial vehicles, which resulted in the sale and now believes that in the near future American made trucks will be as popular in foreign countries as are the pleasure cars produced here.

Automobile Service in Spain—A new automobile service has been inaugurated in Spain between San Fernando, six miles from Cadiz, and Algeciras. San Fernando is connected with Cadiz by an electric tramway and excellent ferry service is maintained between Algeciras and Gibraltar. The automobiles follow the coast for practically the entire distance, making the run between San Fernando and Algeciras in about five hours, as against 14.5 by rail.

Active Year in Belgium—The automobile industry was active in Belgium during the past year, a greater demand having been developed for commercial motorcars. Of the total imports last year, 202 machines, valued at $221,217, were from France, a decrease of 95 machines and $116,889 in value, as compared with 1910. Next to France the imports in 1911 were from Germany, with 58 machines, valued at $64,746, followed by the United Kingdom with 30, valued at $37,334, and the United States, 32, valued at $19,903. The American machines imported in 1910 numbered three, valued at $2218. It is expected that the imports from the United States during 1912 will increase largely, as two agencies representing American cars were established in Belgium during the last year.

British Transport Drivers—Several of the big English taxicab concerns have been approached by the British war office with a view to the provision of drivers for the mechanical transport branch of the British signal corps. Many operators already have been enrolled. The men will be called upon to serve and perform duties similar to those expected of them in civil

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life. When called out on mobilization, they will become in all respects soldiers of the regular forces.

Edict Against High Power—Regarding high power engines as a temptation to exceed the speed limit, the president of police of Berlin, Germany, has issued a formal order against the mounting of such motors in cabs and will refuse to license any more cabs having engines developing above 10 horsepower, according to the revenue formula.

Consul Wants Catalogues—The acting British consular agent at Quilimain, East Africa, requests manufacturers of light forms of such tractors as are capable of hauling up to two tons, to send him catalogues and any other particulars of machines which are likely to interest people of his district.

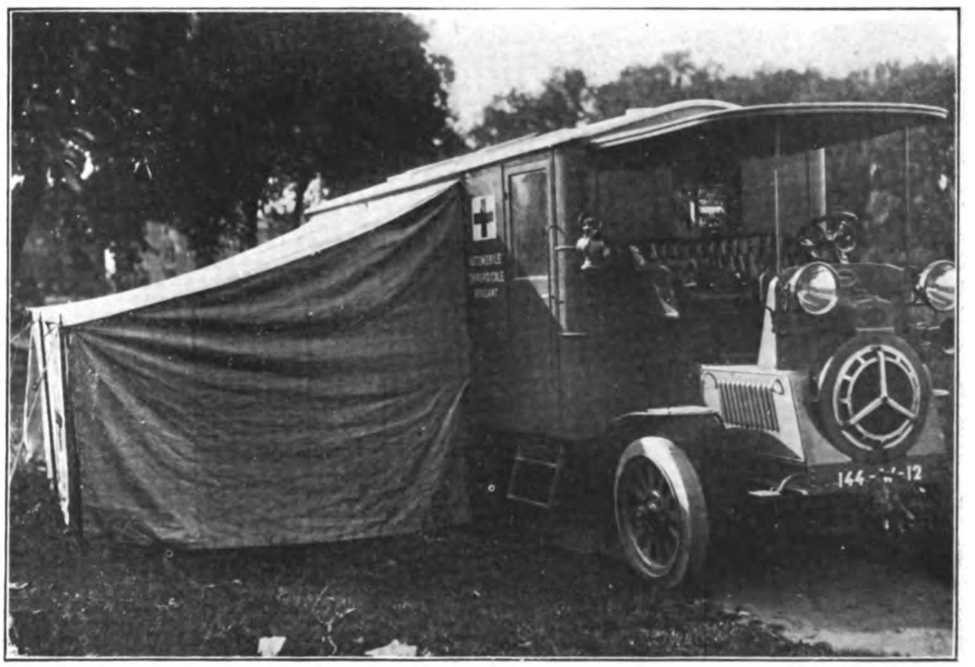
Foreign Need of Automobiles—An American consul reports that there is an opening in his district for an automobile sight-seeing service, as 10,000 tourists stop there annually. At present an unsatisfactory carriage service affords the only means of getting about. When not used for sight-seeing purposes the automobiles could be employed for various other purposes outlined in a report by the consul, a copy of which can be secured by addressing Bureau of Manufactures, Washington, D. C.

Automobiles in Arabia—The Aden-Steamer Point automobile service will shortly test a steam car that has been rebuilt into a gasoline machine. The intention is to revive the passenger service between Aden and Steamer Point, a distance of five miles. An English chauffeur has been engaged to make the tests and the owners declare that if the car is a success, five others will be put in service. One very steep grade has been encountered on the route and the gravelly and flinty roads have proved destructive to the solid rubber tires. It is claimed a tire is useless after it has covered 3000 miles. The promoters are determined to experiment with different cars until the right one is found.

Mexico Wants Motor Trucks—An American consul in Mexico reports that a company in his district is in the market for two or three motor trucks for hauling ore from mines to the railways. These vehicles probably would require steel instead of rubber tires, as the roads upon which they are to operate are rough, rocky mountain stretches. They would have to be sufficiently powerful to travel short distances of 20 per cent. grade. In the absence of rubber tires the trucks would have to be equipped with pneumatic shock absorbing springs in order to preserve the motor. Information and prices are requested on three, five and 10-ton ore capacity trucks. Manufacturers can secure information of the Bureau of Manufactures, Washington, D. C.

New Argyll Engine—Argylls, Ltd., Alexandria, Scotland, maker of the Argyll line, has given an increasing share of its attention to the utility side of the automobile industry, although a large proportion of its business has been in pleasure cars, heretofore. The latest achievement of the company is the advance in the construction of sleeve valve engines.

Motorizing Berlin Fire Department—The fire department of Berlin, Germany, now possesses 50 automobiles. It is estimated that 145 more will be needed to completely motorize the department, which is being accomplished as rapidly as possible.



Boulant Car with Tent Set, Providing Temporary Hospital Within Easy Access of Troops.

Leeds Wants Motor Ambulance—The American consul at Leeds, England, reports that the Workpeople's hospital fund committee is urging the need of a motor ambulance for use in emergency cases for the general infirmary. Makers of such apparatus should send their catalogues and price lists to the secretary of the Leeds Infirmary, or have their English representatives do so immediately.

Motor Mail Service—The old horse drawn van formerly used for the transportation of mail between Exeter and Budleigh Salterton, England, has been replaced by a 25-35 horsepower Darracq. It is of interest to note that last year over $300,000 was saved on the postoffice costs by substitution of motor vehicles.

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RECORDING DEVICES REVEAL EFFICIENCY.

Continuing the Discussion of Modern Transportation Methods and Describing Additional Devices for Solving the Problem of Truck Management.

IN THE previous discussion of the subject of recording devices for the purpose of registering the daily service of the mechanical transport, mention was made of the reasons which impelled the production of

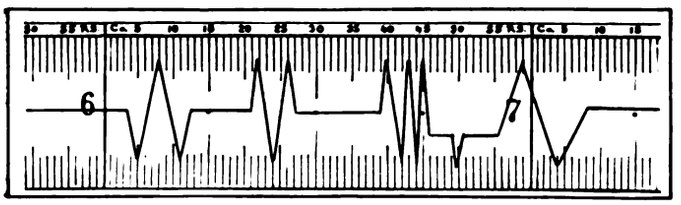


Fig. 8—Portion of a Sample Speedograph Chart.

such instruments. The advantages of possessing an accurate record of the truck's movements will be appreciated readily by business men.

Not only does it prevent possible neglect of the vehicle, disregard of orders by careless and incompetent operators, and loss of time during business hours by those disposed to waste time, but it enables the owner to discover other defects in the delivery system and to take steps to remedy them. It insures that the work of the truck has been done properly and in accordance with the instructions as to speed and mileage. It insures against driving at an unlawful speed, thus reducing the liability of accidents and consequent actions for damages. It furnishes absolute proof, in case of accident or arrest, that the driver was not exceeding a proper and safe speed. And it will be admitted that all of these objects are desirable.

In addition to the devices already illustrated and described, mention may be made of the Speedograph, manufactured by the Recording Speedometer Company, 54 Clinton street, Newark, N. J., and shown herewith opened and closed at Fig. 9. It will be noted that it is a combination speedometer and service recorder.

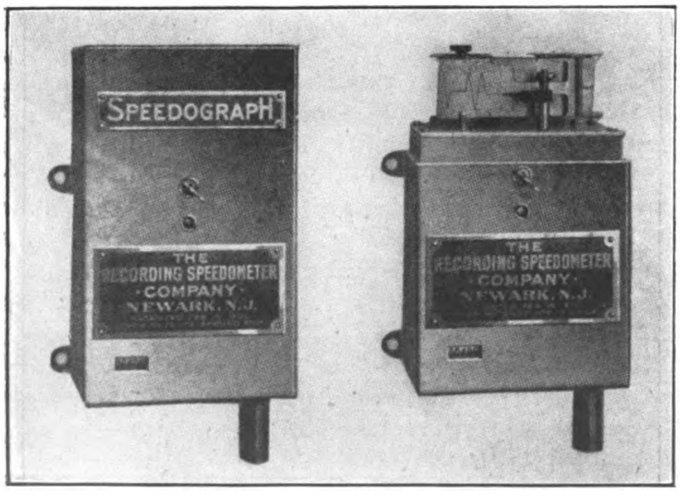


Fig. 9—Speedograph Opened and Closed, Showing Recording Pencil Making Record on Chart.

When closed all parts of the Speedograph are securely locked against anyone not in possession of the key. The lower portion contains the speedometer, which is connected by a set of gears with the actuating device at the top. It is maintained by the maker that there is absolutely no way in which the actuating needle can be tampered with or the gear be thrown out of engagement. In this manner, the owner of the vehicle is assured of an accurate record of its movements.

The Speedograph is designed to check the time the truck leaves the garage or any given point, as well as of the return, every stop made and its duration, total number of miles travelled, the speed and variations in speed during the trip. By comparison with the route sheet it is possible to determine where each

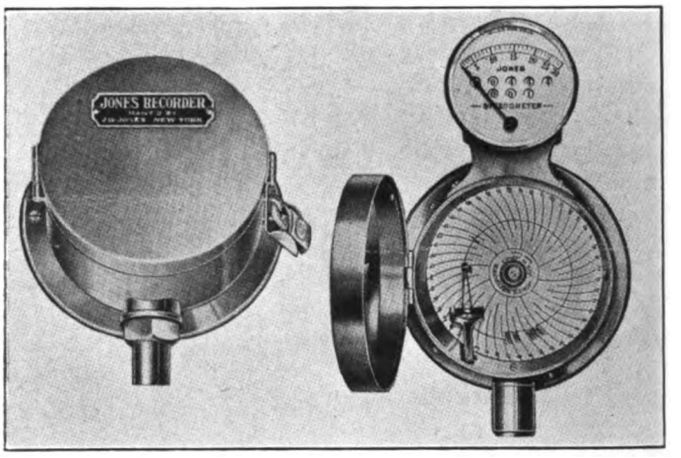


Fig. 10—Front and Rear Views of Jones Recorder, with and Without Speedometer Attachment.

stop was made, and whether or not there was any delay.

Fig. 8 depicts a portion of one day's record, and in explanation it should be stated that the vertical lines indicate the vehicle was moving, while horizontal lines show that it was idle. The tape is divided into minutes, and is moved past the pencil point from one spindle to the other at the rate of three inches an hour, this being timed accurately by clock work. The pencil point travels up and down three-quarters of an inch for each half-mile, and is operated by the wheel of the vehicle.

The above record shows that the car started at 6:03 and was run 1.5 miles at the rate of 10 miles an hour, or one mile in six minutes. From 6:12 until 6:21 the vehicle was standing. From 6:21 to 6:27 it ran 1.5 miles at the rate of 15 miles an hour, or one mile in four minutes. From 6:27 to 6:39 it was standing. From 6:39 to 6:42 it moved at the rate of 15 miles an hour for three-quarters of a mile, then at the rate of 30 miles an hour for 1.675 miles. At 6:46 it stopped

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three minutes, then ran one-quarter of a mile at a 10-mile rate; stopped five minutes; ran 1.75 miles at the rate of six miles an hour, or one mile in 10 minutes, and

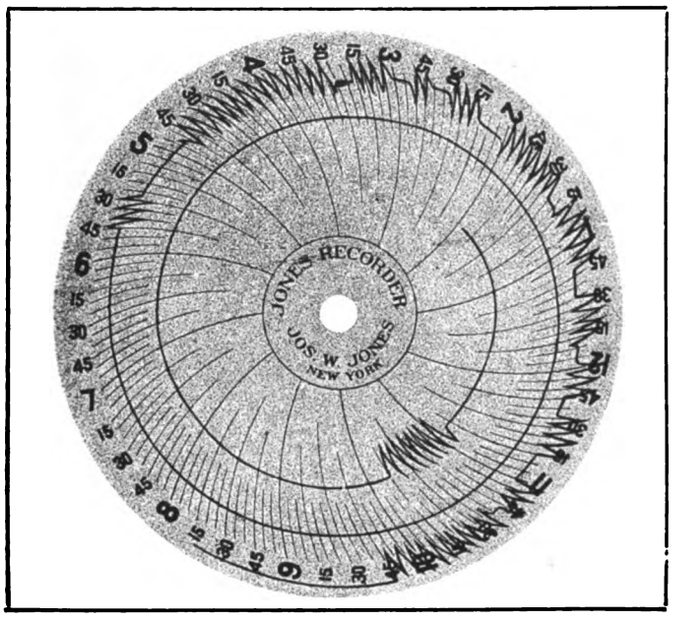


Fig. 11—Sample Jones Recorder Chart, Indicating Character of Permanent Record.

stopped again at 7:08. Thus the record might go on for the entire day, giving the owner opportunity to follow its movements all of the time.

The Jones Speedometer Company, New York City, produces the Jones recorder, which may be furnished separately or in combination with the Jones speedometer, as illustrated at Fig. 10. The company also manufactures a hub odometer, which registers the mileage, either forward or backward. The recorder, however, is designed to supply a complete and accurate history of the vehicle's performance every minute of the 24 hours.

The instrument is enclosed in a heavy brass case and may be attached to the dash or any other convenient part of the car. It is connected by a flexible shaft and gears to the front wheel, in exactly the same manner as the Jones speedometer is fitted. A marking stylus travels over a chart of sensitized paper, which cannot be tampered with, and which gives a permanent record of the truck's movements.

For the device, it is claimed that it is a silent watchman, which guards the interests and property of the owner at all times. It keeps the big investment from lying idle without the owner's knowledge, and eliminates all guess work. The case is locked, and no one can have access to the record except the party who carries the key. The start, stops and their duration, mileage between stops, speed at all times, and time of returning to the garage are set down in a manner even more accurate than would be possible were the vehicle accompanied by a private detective, it is claimed.

While the vehicle is standing the chart is constantly travelling under the marking stylus, the record of a stop being shown by a continuous line. The length of this line indicates the duration of the stop. The running time is shown by cross or zigzag lines, each one of which indicates a half-mile of travel. The speed for the run is calculated by counting the number of zigzag lines made in a given period of time.

Fig. 11 presents one of the charts, and in explanation it may be said that this chart was put on at 8:15. The record shows that the truck was running as follows: 9:45 to 10:37, 9.5 miles; 10:45 to 11, three miles; 11:15 to 11:37, four miles; 11:45 to 12:05, 2.75 miles; 12:15 to 12:35, 4.25 miles; 12:47 to 1:15, five miles; 1:20 to 2, 7.25 miles; 2:15 to 2:35, three miles; 2:45 to 2:55, two miles; 3:05 to 3:22, 3.5 miles; 3:33 to 4:50, 14.5 miles; 5:30 to 5:35, 3.25 miles. There were 12 stops. The truck was out of service for 16.5 hours and then ran again from 10:15 to 11:08, 9.25 miles. The chart was removed at 2 with a total run of 71.25 miles. The average speed was 11 miles an hour. The running time was six hours and 25 minutes.

Still another device of this character is the Veeder hub odometer, made by the Veeder Manufacturing Company, Hartford, Conn. This differs from those previously described, in that there is no chart, the main object being to disclose the mileage obtained from the truck or other vehicle. Additional details of the car's movements are possible of computation, however, and the company states that a reading of the register will give the owner all the essential information.

The illustrations at Figs. 12, 13 and 14 show the instrument, its method of attachment and the interior mechanism. A small spur gear is used to drive the odometer. A shank on the side of this gear is inserted in a hole in the end of the axle. The cotter pin which locks the nut, passes through this shank and prevents the gear from turning or becoming loose. This gear

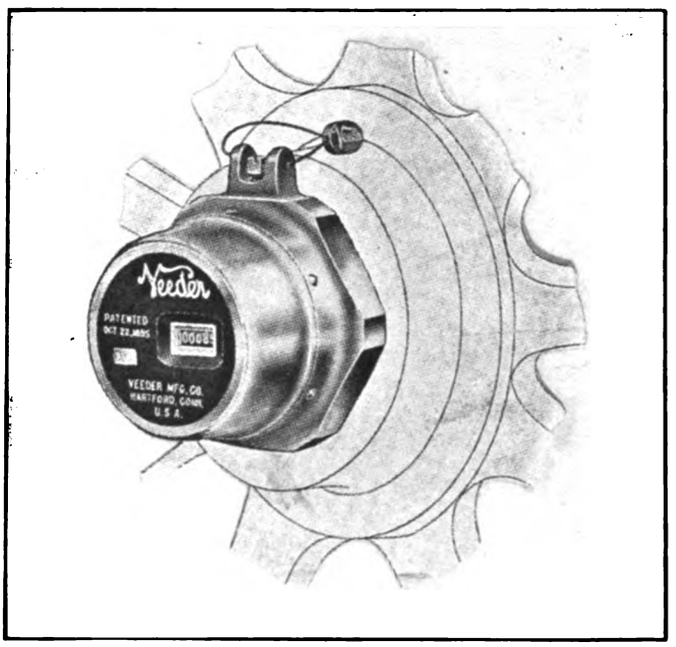


Fig. 12—Veeder Hub Odometer Sealed in Place on Vehicle Hub.

meshes with the spur gear shown in Fig. 13, and suitable mechanism inside the cap, Fig. 14, drives the register always in the same direction, so that the entire

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distance travelled by the car, whether forward or backward, is recorded.

It is maintained that there is no way to take the

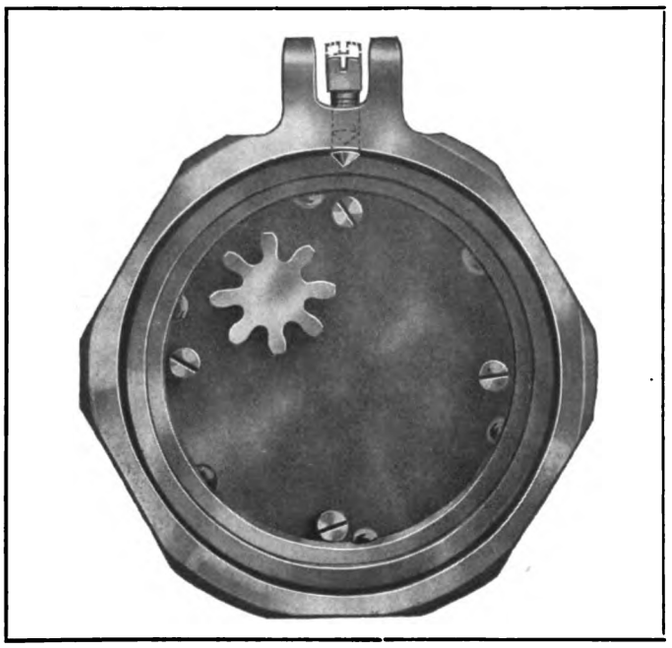


Fig. 13—Inner End of Hub Odometer, Showing Spur Gear and Set Screw.

instrument off except by unscrewing it from the hub. This can be done only after the set screw, shown in Fig. 13, has been withdrawn sufficiently to permit the cap to be turned, an operation that cannot be accomplished without first breaking the seal, depicted in Fig. 12. This seal is the same in form as that which has been used for many years by railroad people and is held absolutely to prevent tampering with the odometer without the owner's knowledge.

While the device may be attached either to the right or left hub, the latter is recommended by the maker, because the left wheel is less liable to come in contact with the curb, posts, etc. It can be used on any wheel having a dead axle.

As has been explained the odometer is designed so as to record the distance travelled, no matter whether the car is going forward or backward, so that it is impossible for the driver to substract mileage by jacking up the wheel and running it backward. It is held that there is no way to disconnect the mechanism by slipping the gears out of mesh.

The hub odometer has been found an exceptionally valuable instrument for cars of all types, whether utilized for pleasure or commercial purposes, and particularly on taxicabs. It is obvious that with an exact record of the mileage available at all times, the owner is in possession of data which will aid materially in computing the cost of motor haulage.

The Harwood & Bailey Company, with factory location in Marion, Ind., among the more recent truck manufacturers to enter the field, has produced a two-ton vehicle in addition to the one of 1.5 tons capacity, which it first started to make. The new machine was demonstrated on the streets of Marion recently.

VELIE HAS PERFECT SCORE.

Lieut. Bubb of the United States Army recently rendered his final reports in connection with the Velie three-ton truck, made by the Velie Motor Vehicle Company, Moline, Ill., in war service. The truck run was held under the direction of Capt. Williams of the United States Army starting at Dubuque, Ia., and finishing 26 miles out of Madison, Wis., where the army went into camp. A perfect score was reported for the entire trip. The first run of the vehicle was from Moline, starting at 5 in the morning and arriving at Dubuque at 2 in the afternoon, a distance of 86 miles, when it was at once put into service. It was used in the tests for hauling supplies for 2200 soldiers, and many times was found useful in assisting horse drawn trucks which had become stuck in sand and mud.

PEERLESS AMBULANCE SUCCESSFUL.

A new 30 horsepower, four-cylinder Peerless combination police patrol and ambulance was recently placed in commission in the city of Medford, Mass., and has already successfully demonstrated its efficiency over horse drawn vehicles. It has reduced the time required to reach any of the city's boundaries from 20 to about five minutes. A saving has also been made in starting as well as in travelling. But one man is required to run the machine, where heretofore an extra man had to care for the horse which drew the ambulance. It will answer alarms of fire as well as police and regular calls. The automobile is equipped with a

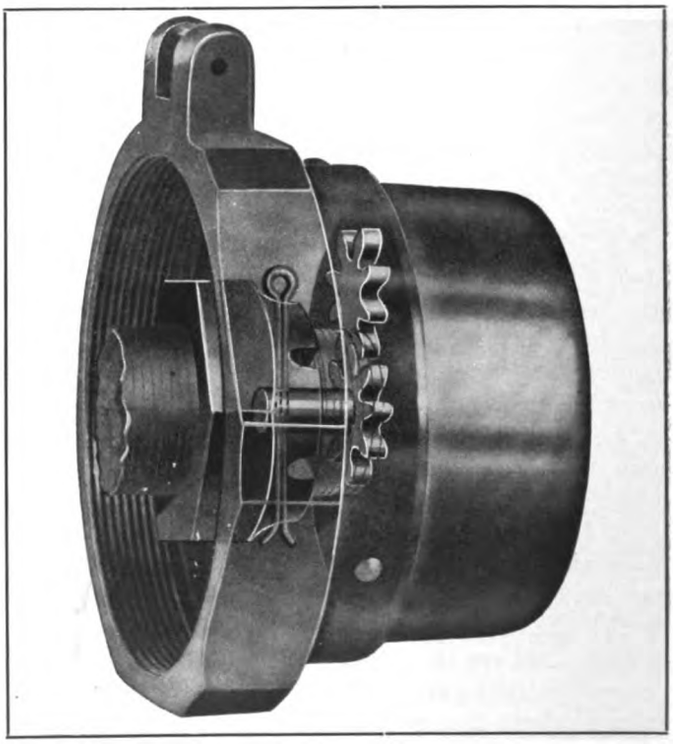


Fig. 14—Shadow View of Hub Odometer, Attached to Axle, and Showing Operating Mechanism.

first aid to the injured kit and will have two stretchers when used for ambulance purposes. Fire extinguishers loaded with chemicals are carried in front.

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WILL LICENSE MAKERS UNDER DYER PATENTS.

Automobile Board of Trade Enters Contract with Enterprize Automobile Company, Affecting Rights to Use Sliding Gear Transmissions.

UNDER date of Aug. 13, the Automobile Board of Trade announces an arrangement between it and the Enterprize Automobile Company of Hoboken, N. J., granting to its members licenses to operate under the so-called Dyer patents, numbered 643,595, 657,650, 662,400, 662,401, 676,223, 886,986 and 921,963. Incidentally, it may be remarked that the contract also includes the right to licenses under any automobile patents that may be granted in the future to Leonard H. Dyer, to whom the patents named above were originally issued. The commercial vehicle industry appears to be affected in like manner as the manufacturers of pleasure cars.

It should be stated that the five patents first enumerated were acquired some six years ago by the Patents Holding Association, then a subsidiary of the Association of Licensed Automobile Manufacturers, which was succeeded by the Automobile Board of Trade soon after the adverse court decision in the so-called Selden patent cases in January, 1911. These have now been turned over to the Enterprize Automobile Company as a part of the consideration mentioned in the contract. L. H. Dyer is president of the Enterprize Automobile Company, having been elected recently to succeed John R. Taylor, with whom he has been associated in the practise of patent law since 1897.

Patent 643,595 was granted Feb. 13, 1900, and is held to cover two gears and an intermediate epicyclic gearing interposed between one of the gears and the driven axle. Antedating this a trifle in the matter of application is patent 657,650, which was granted Sept. 11, 1900, and is held to cover a fixed guide plate with recesses and notches to hold the gear shifting lever. Patent 662,400, granted Nov. 27, 1900, relates to the subject of two shafts with spur gearing and means for intermeshing the gear wheels so as to transmit power from the driving to the driven shaft. Patent 662,401 is for a multiple speed transmission gearing, and is similar to the main patent, described below except that the gears cannot be shifted as an entirety and the principle of direct drive with all gearing quiescent is not covered. Patent 676,223 is held to cover a removable rigid bridge to carry the motor and operating parts.

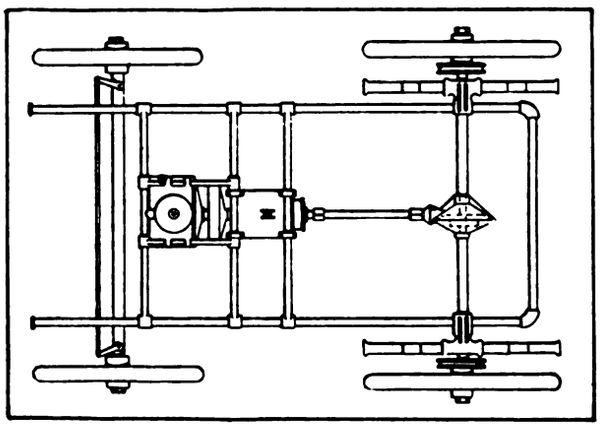
What is termed the main patent is that numbered 885,986, for which application was made Jan. 22, 1900, and which was issued April 28, 1908. This is claimed to extend backward in its effect to Feb. 3, 1900, inasmuch as it is declared to be a division of an application for a patent filed that date, which was later granted as patent 921,963 under date of May 19, 1909. This last patent is claimed to underlie the so-called main patent as a sort of foundation for it, and is held to cover improvements in the frame, driving gear, and changing and reversing mechanism of a motor vehicle.

It will be noted that the so-called main patent has very nearly 13 years to run, and inasmuch as this is the patent held to cover practically all forms of sliding gear transmission now in use on motor vehicles in this country, it will prove of interest to study the claims, which are 57 in number. The sketches presented herewith are taken from the original patent drawings and in connection with the claims set forth the entire situation with respect to patents 885,986 and 921,963. The latter has but three claims and reads as follows:

Claims of Patent 921,963.

1—The combination in a vehicle of a spring-supported frame, driving and steering wheels, a motor mounted upon the front of the frame, a shaft driven by such motor and in line with the shaft of the motor, the said shaft being longitudinally arranged substantially at an equal distance between the wheels and substantially parallel with the ground, a friction clutch connecting the shaft to the motor, a second shaft in line with the first shaft, means for directly connecting the two shafts for driving the second shaft without reduction in speed, means for breaking the connection between the two shafts and for connecting them together through power transmitting mechanism, affording a reduced speed, a differential gear between the second shaft and the wheels of the vehicle, and a reversing gear for reversing the direction of travel of the vehicle.

2—The combination in a vehicle of a spring-supported frame, driving and steering wheels, a motor mounted upon the front of the frame, a shaft driven by such motor and in line with the shaft of such motor, the said shaft being longitudinally arranged between the wheels,



Showing Location of Dyer Patent Device, Looking Down upon a Motor Vehicle Chassis.

a friction clutch connecting the shaft to the motor, a second shaft in line with the first shaft, means for directly connecting the two shafts for driving the second shaft without reduction in speed, and means for breaking the connecting between the two shafts and for connecting them together through power-transmitting mechanism, affording a reduced speed.

3—The combination in a vehicle, of a spring-supported frame, driving and steering wheels, a motor mounted upon the front of the frame, a shaft driven by such motor and in line with the shaft of the motor, the said shaft being longitudinally arranged between the wheels, a friction clutch connecting the shaft with the motor, a second shaft in line with the first shaft, means for directly connecting the two shafts for driving the second shaft without reduction of speed, means for breaking the connection between the two shafts and for connecting them together through power-transmitting mechanism, affording a reduced speed, and a reversing gear for reversing the direction of travel of the vehicle.

Claims of Patent 885,986.

1—In a transmission for motor vehicles, the combination of a driving member, a driven member, a driving gear for the former, a plurality of intermediate gears, including a reversing gear and means, including mechanism shiftable as an entirety, for driving said driven member through any one of said intermediate gears.

2—In a transmission gear for motor cars, the combination of a driving member, a driven member, a driving gear for the former, a plurality of intermediate gears including a reversing gear and means, including mechanism shiftable as an entirety, for coupling said driving member to said driven member and for also driving said driven member through any one of the said intermediate gears.

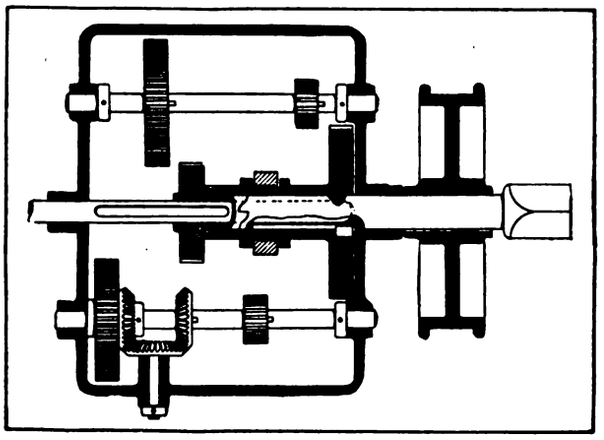
3—Transmission mechanism for motor vehicles, the same comprising a driving member, a driven member, means to couple said driven member to said driving member to be driven by the latter and means comprising mechanism shiftable as an entirety to drive said driven member at a different speed for said driving member and to drive said driven member in reverse direction from said driving member.

4—Transmission mechanism for motor vehicles, the same comprising a driving member, a driven shaft axially aligned therewith, means to couple said member and shaft, one to the other for direct drive of the latter by the former, a plurality of gears arranged out of line with

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the axis of said shaft and driven by said member, and a shiftable transmission device on said shaft and adapted to engage the said plurality of gears to drive said shaft in the same, and also in a reverse direction.

5—In a transmission gear for a motor vehicle, the combination of driving member, a driven member, and means comprising mechanism shiftable as an entirety coupling said driving member to said driven member to drive the latter from the former and for varying the speed



Dyer Patent as Applied to Low Speed and Reversing Gears.

and direction of movement transmitted from said driving member to said driven member.

6—Transmission mechanism for motor vehicles, the same comprising a driving shaft, a plurality of fixed intermediate gears, including a reversing gear, means for supporting said gears, a driven shaft and means comprising a longitudinal, shiftable transmission device to rotate the latter from the driving shaft to any one of said intermediate gears.

7—Transmission mechanism for motor cars, same comprising a driving shaft, gear supporting means driven therefrom at a reduced speed, a plurality of fixed intermediate gears, including a reversing gear, a driven shaft and means comprising a longitudinal, shiftable transmission device to rotate the latter from the driving shaft through any one of said intermediate gears.

8—Transmission mechanism for motor vehicles, comprising a driving member, a driven member, a shiftable transmission member, means co-ordinate therewith to couple said driven member to said driving member, one or more stationary intermediate gears driven by said driving member and means to bring said transmission member into separate engagement and disengagement with said one or more intermediate gears.

9—Transmission mechanism comprising a driving member and a driven member adapted to be driven one by the other at the same speed, at different speeds, or in a reverse direction and mechanism longitudinally shiftable as an entirety for obtaining such changes in speed and direction.

10—Transmission mechanism for motor vehicle comprising a driving member, a driven intermediate gear, a jack-shaft arranged at transmission device on said shaft, means for coupling said driving member and said driven shaft one to the other for the direct drive of the latter by the former, one or more stationary gears arranged at one side of the axis of said shaft and driven by said driving member and means to shift such transmission device into engagement with the said one or more gears.

11—In a motor vehicle, a motor, clutch, driving gear and driven shaft, all axially aligned, intermediate gears between said driven shaft and driving gear, mechansim shiftable as an entirety to couple said driven shaft to said driving gear and to drive said shaft from said driving gear through any one of said intermediate gears, a jack-shaft arranged at an angle with said driven shaft and driven therefrom and vehicle driving wheels connected with and driven from said jack-shaft.

12—In a motor vehicle, a motor, clutch, driving shaft and driven shaft, all axially aligned, means comprising mechanism shiftable as an entirety for varying the speed and direction of movement transmitted from said driving shaft to said driven shaft, a jack-shaft arranged at an angle with said driven shaft and driven therefrom and vehicle driving wheels connected with and driven from said jack-shaft.

13—In a transmission gear for motor vehicles the combination of a driving member, a driven member, axially aligned therewith and means comprising mechanism shiftable as an entirely to couple said driving and driven members together and to vary the speed and direction of movements transmitted from said driving member to said driven member.

14—In a speed changing gear for motor vehicles, the combination with a motor shaft, a driven shaft, means for connecting the two together to secure high speed, a low speed gearing consisting of a plurality of gear wheels caused to engage by longitudinal shifting movements and means for producing reverse rotation of the driven shaft.

15—In a motor vehicle the combination with the motor and driving wheels, of a gearing connecting the driving wheels and motors, the said gearing comprising a longitudinal shaft and a clutch connecting the shaft to the motor, and by means of which it will be driven, of means for rotating the wheels and a portion of the shaft at a different speed ratio, the said means including a jaw-clutch and longitudinally sliding gears, a single lever for sliding the gears and engaging and disengaging the jaw-clutch and a reverse gearing, and means operated by the said lever for engaging the reverse gearing.

16—In a motor vehicle the combination with a driving motor and driving wheels, of a gearing connecting the two, the said gearing comprising longitudinally aligned driving and driven shafts and a clutch connecting the driving shaft to the motor, and by means of which it will be driven, connections between the driven shaft and the driving wheels, gearing connecting the longitudinal shaft to positively drive the driven shaft at low or high speed, and comprising longitudinally sliding gears and a second clutch, and a single manually operated sliding device for sliding the gears, and for engaging the second clutch.

17—In a motor vehicle, the combination with a driving motor and driving wheels, of a gearing connecting the two, said gearing comprising longitudinally aligned driving and driven shafts and a clutch connecting the driving shaft to the motor and by means of which it will be driven, connections between the driven shaft and the driving wheels, gearing connecting the longitudinal shafts to positively drive the driven shaft at low or high speeds, and comprising longitudinally sliding gears and a second clutch, and a single actuating lever for sliding the gears and for engaging and disengaging the second clutch.

18—In a motor vehicle, the combination with the motor and driving wheels, of a gearing connecting the two, the said gearing comprising longitudinally aligned driving and driven shafts and a clutch for connecting the two, for driving the driven shaft at high speed, and reduced speed gearing for positively driving the driven shaft at a reduced speed and means for engaging the said reduced speed gearing, the said reduced speed gearing being entirely disconnected when not in use, and being introduced and disengaged by a longitudinally sliding movement.

19—In a motor vehicle the combination with the motor and driving wheels of a gearing connecting the two, the said gearing comprising longitudinally aligned driving and driven shafts and a clutch for connecting the two for driving the driven shaft at high speed, and reduced speed gearing and reverse gearing for positively driving the shaft at a reduced speed, or in the reverse direction, and means for engaging the said reduced gearing and reverse gearing, the said reduced speed gearing and reverse gearing being entirely disconnected when not in use, and being introduced and disengaged by a longitudinally sliding movement.

20—In a motor vehicle the combination with the motor and driving wheels, of a gearing connecting the two, the said gearing comprising a longitudinal shaft, a clutch connecting the shaft to the motor and by means of which it is driven, connections between the shaft and the driving wheels, and a change speed device for rotating a portion of the shaft at a less speed than the motor, the said change speed device comprising an auxiliary shaft, and gears on the longitudinal shaft and means for intermeshing the gears by a sliding movement.

21—In a motor vehicle, the combination with the motor and driving wheels of a gearing connecting the two, the said gearing comprising a longitudinal shaft, a clutch connecting the shaft to the motor, and by means of which it is driven, connections between the shaft and the driving wheels and a change speed device for rotating a portion of the shaft at a less speed than the motor, the said change speed device comprising an auxiliary shaft and gears on the longitudinal shaft, and means for intermeshing the gears by a sliding movement, the said means comprising a single manually operated lever.

22—In a motor vehicle the combination with the motor and driving wheels, of a gearing connecting the two, the said gearing comprising a longitudinal shaft, a clutch connecting the shaft to the motor, and by means of which it is driven, connections between the shaft and the driving wheels and a change speed device for rotating a portion of the shaft at a less speed than the motor, the said change speed device comprising an auxiliary shaft, mounted in rigid bearings, gears rigidly mounted on the auxiliary shaft and gears on the longitudinal shaft, and means for intermeshing the gears by a sliding movement.

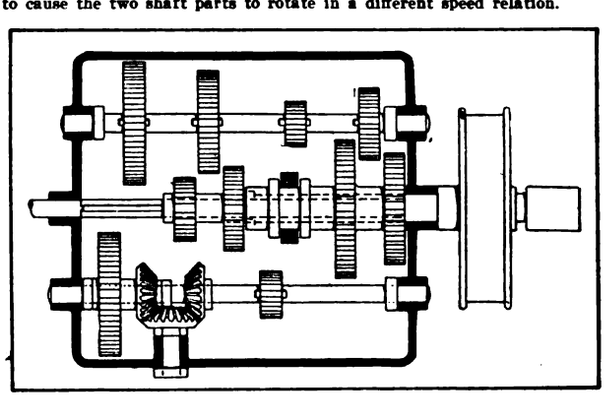
23—In a motor vehicle the combination with a driving shaft made in two parts, of a clutch made in two parts and connecting the shaft parts, one of the clutch parts sliding upon its supporting shaft part, a gear connected to the sliding clutch part and sliding with it, an auxiliary shaft, gears thereon and means for sliding the moving clutch part and its companion gear to disengage the two shaft parts and engage the gear with a gear on the auxiliary shaft, to cause the two shaft parts to rotate at a different speed relation.

24—In a motor vehicle the combination with a driving shaft in two parts, of a clutch made in two parts and connecting the shaft parts, one of the clutch parts sliding upon its supporting shaft part, a gear connected to the sliding clutch part and sliding with it, a gear on the other shaft part and rotating with it, an auxiliary shaft gear thereon, the said shaft being mounted on rigid bearings and means for sliding the moving clutch part and its companion gear to disengage the two shaft parts and engage the gear with a gear on the auxiliary shaft, to cause the two shaft parts to rotate in a different relation.

25—In a motor vehicle, the combination with a driving shaft made in two parts, of a clutch made in two parts and connecting the two shaft parts, one of the clutch parts sliding upon its supporting shaft part, a gear connected to the sliding clutch part and sliding with it, a gear on the other shaft part and rotating with it, and auxiliary shaft, gears thereon, the gears being rigidly mounted on the shaft and means for sliding the moving clutch part and its companion gear to disengage the two shaft parts and engage the gear with a gear on the auxiliary shaft to cause the two shaft parts to rotate in a different speed relation.

26—In a motor vehicle the combination with a driving shaft made in two parts, of a gear case, a clutch made in two parts and connecting the two shaft parts, one of the clutch parts sliding upon its supporting shaft part, a gear connected to the sliding clutch part and sliding with it, a gear on the other shaft part and rotating with it, an auxiliary shaft, mounted in rigid bearings, carried by the gear case, gears movable in a fixed plane with respect to said shaft, on the auxiliary shaft and means for longitudinally sliding the moving clutch part and its companion gear to disengage the two shaft parts and engage the gear with a gear on the auxiliary shaft to cause the two shaft parts to rotate in a different speed relation.

27—In a motor vehicle, the combination with a driving shaft made in two parts, of a gear case, bearing on the gear case for the shaft parts, a clutch made in two parts and connecting the two shaft parts, one of the clutch parts sliding upon its supporting shaft part, a gear connected to the sliding clutch part and sliding with it, a gear on the other shaft part and rotating with it, an auxiliary shaft, mounted in rigid bearings, carried by the gear case, gears on the auxiliary shaft, the said gears being rigidly mounted on the shaft and means for sliding the moving clutch part and its companion gear to disengage the two shaft parts and engage the gear with a gear on the auxiliary shaft to cause the two shaft parts to rotate in a different speed relation.



Additional Forward Speeds Obtained by Addition of Extra Secondary Gears on One of the Auxiliary Shafts, Together with Others on Main Driving Shaft.

28—In a motor vehicle, the combination with a shaft made in two parts of a gear case, bearings on the gear case for the shaft parts, a clutch made in two parts and connecting the two shaft parts, one of the clutch parts sliding upon its supporting shaft part, a gear connected to the sliding clutch part and sliding with it, a gear upon the other shaft part and rotating with it, and auxiliary shaft, mounted in rigid bearings carried by the gear case, gears on the auxiliary shaft, and

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means carried within the gear case for sliding the moving clutch part and its companion gear to disengage the two shaft parts and engage the gear with a gear on the auxiliary shaft to cause the two shaft parts to rotate in a different speed relation.

29—In a motor vehicle the combination with a driving shaft made in two parts, of a gear case, bearings on the gear case for the shaft parts, a clutch made in two parts and connecting the two shaft parts, one of the clutch parts sliding upon its supporting shaft part, a gear connected to the sliding clutch part and sliding with it, a gear on the other shaft part and rotating with it, an auxiliary shaft mounted in rigid bearings carried by the gear case, gears on the auxiliary shaft, the said gears being rigidly mounted on the shaft, and means carried within the gear case for sliding the moving clutch part and its companion to disengage the two shaft parts and engage the gear with a gear on the auxiliary shaft to cause the two shaft parts to rotate in a different speed relation.

30—A motor vehicle having driving wheels, a motor, a shaft in line with the motor shaft, a clutch connecting the two to cause the shaft to rotate at the same speed as the motor, the shaft being longitudinally arranged between the driving wheels and divided into two sections, a device for connecting and disconnecting the two sections for causing them to rotate as an entirety or to permit independent rotation, means for rotating the rear section of the shaft at a lesser speed than the motor or in a reverse direction, said means including sliding gears, longitudinally movable in a fixed plane with respect to said shaft and mechanism for so moving said gears.

31—In a motor vehicle, the combination with a shaft formed of two parts, a connecting clutch and a gear on each shaft part, of a second shaft and gears thereon, and a single lever for shifting the gears on the first shaft and actuating the clutch.

32—Transmission for a motor vehicle, having a shaft formed of two parts, one telescoping within the other, connecting a clutch, a gear carried by one clutch member, a second gear connected to the first gear but freely rotatable with respect thereto, a second shaft, and gears thereon and a single lever for shifting said first gears, and actuating the clutch.

33—In a motor vehicle, the combination with a shaft formed of two parts, of a clutch connecting the two parts, a sleeve surrounding the abutting ends of the two parts, a gear formed integral with the clutch, and engaging with one part, a second gear formed integral with the sleeve and engaging with the other part, an auxiliary shaft, gears thereon disengaged at the high speed, intermediate gears interposed between the gears on the second shaft, and means for moving the sleeve, clutch and gears to disengage the two shaft parts and intermesh the gears whereby the two parts of the shaft may be caused to rotate in different speed relation.

34—Transmission gearing for a motor vehicle, having a shaft formed of two parts, one telescoping within the other, a connecting clutch, a gear integrally formed upon one clutch member, a second gear, a sleeve thereon, connecting with, but freely rotatable with respect to the first gear, a second shaft with gears thereon and a single shifting lever for sliding first gears and disengaging the clutch.

35—In a motor vehicle, a gear case therefor, having a cover and supporting brackets, with a set of common securing bolts.

36—In a motor vehicle, a combination of a shaft therefor, formed in two parts, a fixed clutch member on one part, a movable clutch member on the other, gears connected to said movable member, a plurality of auxiliary shafts, gears thereon, and means for sliding said movable clutch member and connected gears along the shaft to disengage the clutch and intermesh the gears seriatim.

37—In a motor vehicle, the combination with the shaft, formed in two parts of a clutch for connecting parts together to cause the shaft to rotate as an entirety, slidable gears on the shaft's parts, connecting to and working with one clutch member, auxiliary shafts with gears thereon, and means, which being moved, will first disengage the clutch and move the gears to a position to engage with the gears on one auxiliary shaft to cause the shaft's parts to partake of the different speed relations, and the continuation of the movement will cause the gears to engage with the gears on the other auxiliary shaft and cause the shaft's parts to rotate in opposite directions.

38—In a motor vehicle, the combination with an operating motor, of connections between the motor and the driving wheels, comprising a two-piece shaft connected thereto, connections to said shaft and driving wheels, a clutch connecting the two parts of the shaft, a gear carried by one part of the shaft, a second gear carried by the other part, connections between the gears and the clutch for moving altogether, an auxiliary shaft, two gears secured thereto, out of mesh with the other two gears at the high speed, a second auxiliary shaft, two gears secured thereto, normally out of mesh with the first two gears, intermediate gearing interposed between the two gears on the second auxiliary shaft, and means for disengaging the clutch and intermeshing the different gears, whereby the two parts of the shaft may be caused to rotate in different speed relations.

39—In a motor vehicle, the combination with the driving shaft made in two parts, of the clutch connecting the two parts, a sleeve surrounding the abutting ends of the two parts, a gear formed integral with the clutch, a second gear formed integral with the sleeve and engaging with the other part, and an auxiliary shaft, gears thereon, disengaged at the high speed, and means for moving the sleeve, clutch and gears to disengage the two shaft parts and intermesh the gears, whereby the two parts of the shaft may be caused to rotate in different speed relations.

40—In a motor vehicle, the combination with the driving shaft made in two parts, of a clutch connecting the two parts, a sleeve surrounding the abutting ends of the two parts, a gear formed integral with the clutch, a second gear formed integral with the sleeve and engaging with the other part, an auxiliary shaft, gears thereon, disengaged at the high speed, a second auxiliary shaft gears thereon disengage at the high speed and means for moving the sleeve, gears and clutch to disengage the two shaft parts and intermesh the gears, whereby the two parts of the shaft may be caused to rotate at different speeds.

41—In a motor vehicle, the combination with the driving shaft made in two parts, of a clutch connecting the two parts, a sleeve surrounding the abutting ends of the two parts, a gear formed integral with the clutch and engaging with one part, a second gear formed integral with the sleeve and engaging with the other part, and an auxiliary shaft, gears thereon, disengaged at the high speed, intermediate gearing interposed between the gears, means for moving the sleeve, clutch and gears to disengage the two shaft parts and intermesh the gears.

42—In a motor vehicle, the combination with a motor and driving wheels, of connections between said motor and the driving wheels, including a two-piece shaft, a clutch connecting the two shaft pieces, gears upon the shaft pieces and auxiliary shaft with gears thereon, said gears being so arranged as to be out of mesh when the clutch is engaged, an element longitudinally shiftable as an entirety for actuating said clutch and intermeshing said gears, substantially as set forth.

43—In a motor vehicle, the combination with the shaft formed in two parts, one telescoping within the other, of a connecting clutch, a gear integrally formed upon one clutch member, a second gear connected to the first gear but freely rotatable with respect thereto, a second shaft, and gears thereon, and a single lever for shifting said first gears and actuating the clutch, substantially as described.

44—In a motor vehicle, the combination with the driving shaft formed in two parts, of a fixed clutch member on one part, a sliding clutch member on the other part, a gear rigidly connected to said slidable member, a gear rotatably connected to said slidable member, and auxiliary shaft, gears thereon and means for moving said slidable clutch member and connected gears along the shaft to disengage the clutch and intermesh the gears.

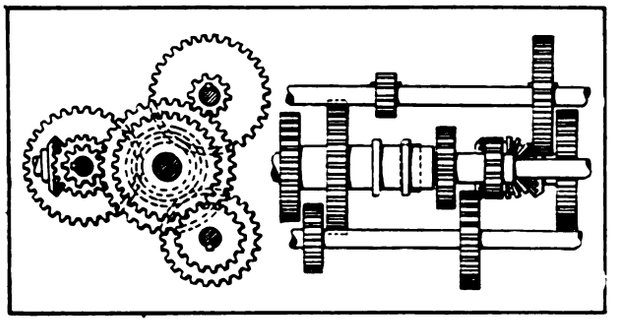
45—In a motor vehicle, the combination with an operating motor, of connections between the motor and the driving wheels, comprising a two-piece shaft connected thereto, the connections between said shaft and driving wheels, a clutch connecting the two parts of the shaft, a gear carried by one part of the shaft, a second gear carried by the other part, connections between the gears and clutch for moving all together, an auxiliary shaft, two gears secured together, out of mesh with the other two gears at high speed, a second auxiliary shaft, two gears secured thereto out of mesh with the first two gears at the high speed, and means for disengaging the clutch and intermeshing the gears, whereby the two parts of the shaft may be caused to rotate in different speed relations.

46—In a motor vehicle, the combination of the driving wheels, the motor, the driving shaft between the motor and driving wheels, made of two longitudinally aligned sections, a clutch arranged to couple the sections so that the driving shaft may turn as an entirety and longitudinally sliding speed reducing gearing arranged to connect the shaft sections, and so co-ordinated with said clutch that the engagement of said gearing will effect the prior disengagement of said clutch and vice versa.

47—In combination in a change-speed mechanism, a driving shaft, a driven shaft, gears mounted upon said driving shaft and driven shaft, intermediate gears on an axis in fixed relation with the axis of said driving and driven shafts, means for transmitting power from said driving shaft to said driven shaft through said intermediate gears, and means movable on the driven shaft for directly connecting the driving and driven shafts with all intermediate gears at rest.

48—In combination in a change-speed mechanism, a driving and a driven shaft arranged in the same axial line and adapted to have independent movement, change gears carried upon the driving and driven shafts, means for varying the position of said gears, power transmitting means adopted to connect a gear on said driving shaft and on said driven shaft and a clutch mechanism for directly connecting said driving and driven shafts.

49—In combination in a change-speed mechanism, a driving shaft, a gear borne upon said shaft, a countershaft, a gear borne upon the counter shaft and meshing with the gear upon the driving shaft, a driven shaft operatively arranged with relation to the driving shaft and provided with a clutch mechanism adapted to clutch it directly



Views of the Device as Seen from Above and from One End.

to said shaft, and intermediate gears borne upon the driven shaft and counter shaft, whereby the speed of the former may be varied with relation to the speed of the latter.

50—In combination in a change-speed mechanism, a driving shaft and driven shaft, a driving gear for the former, a plurality of intermediate gears including a reversing gear and means for driving said driven shaft through any one of said intermediate gears.

51—In combination in a change-speed mechanism, a driving shaft, a driven shaft, a plurality of transmission gears mounted to slide thereon, a plurality of intermediate gears arranged to engage and drive respectively, but singly, the said transmission gears, and means to couple said driven shaft directly to said driving shaft.

52—In a motor vehicle, the motor, clutch, driving gear and driven shaft, all axially aligned, means to drive said driven shaft from said driving gear at the same and also at different speeds, a jack-shaft arranged at an angle with said driven shaft and driven therefrom, and vehicle driving wheels connected with and driven from said jack-shaft.

53—In combination, in a change-speed mechanism, a driving shaft, a driven shaft, a counter shaft in fixed relation to said driving and driven shafts, and operative gearing on said shafts, and inclosing casing, a bearing in said casing for one end of the driven shaft, the other bearing for said driven shaft being in the driving shaft.

54—In combination in a change-speed mechanism, a driving shaft and a driven shaft, operatively arranged, an inclosing casing, a bearing in said casing for one end of one of said shafts, the other end of said shaft having a bearing in the other shaft, a counter shaft in fixed relation to said driving and driven shafts and a plurality of gears connecting said counter, driving and driven shafts.

55—In combination in a change-speed mechanism, a driving shaft and a driven shaft, the driven shaft having a bearing in the driving shaft, and means movable on the driven shaft to engage the surrounding end of the driving shaft to rotate the two shafts at the same speed, a counter shaft in operative fixed relation to said driving and driven shafts and a plurality of gears connecting said counter, driving and driven shafts.

56—In combination in a change-speed mechanism, a driving shaft and a driven shaft axially aligned, a counter shaft in fixed relation to said driving and driven shafts, a plurality of gears connecting said counter, driving and driven shafts, and inclosing casing, a bearing in said casing for one end of the driven shaft.

57—In a transmission mechanism for motor vehicles, a casing, a driving shaft or shaft section projecting into said casing at one side, a bearing therefor in the wall of said casing, a gear and clutch part fixedly secured on or integral with said shaft section, and entirely on one side of said bearing within said casing, a driven shaft in said casing having a movable complementary clutch part, a counter shaft in fixed relation to said driving and driven shaft, and a plurality of gears on said shaft whereby varying speeds are transmitted to a shaft projecting from said casing.

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The MOTOR TRUCK
Devoted to Motor Driven Business Vehicles of All Classes.

VOL. III. PAWTUCKET, R. I., OCTOBER, 1912 No. 10

THE 1912 BOSTON ELECTRIC SHOW.

Motor Vehicle Department a Great Feature of a Wonderful Demonstration of Electrical Possibilities, and Ideal Garage a Splendid Education--Exposition a Magnificent Spectacle, Especially with the Night Illumination.

OF ALL the industrial expositions held in Boston none approached the 1912 Boston Electric Show, which was inaugurated in Mechanics' building, Huntington avenue, the evening of Sept. 28, and which will be concluded the night of Oct. 26. When this measure is applied and comparison made with former exhibitions it is with keen realization of their magnitude, but from every viewpoint the show is more spectacular and has a broader scope, for it is a demonstration of the possibilities of utilizing electric energy for light, heat and power. There is not a person who has not more or less concern in science, industrial and domestic arts, and besides these attractions there are innumerable progressions through the application of electricity that cannot fail to centralize the attention of the visitors.



Mechanics' Building, Where the 1912 Boston Electric Show Is in Progress, and Huntington Avenue, Seen from Irvington Street at Night.

One of the features of the exhibition is the fact that during its progress all displays and demonstrations will be by artificial light, for daylight has been excluded from the building, and by night the great structure is brilliantly illuminated, the exterior being outlined by thousands of constant and intermittently lighted lamps. The visitor to the Back Bay is at a distance impressed by the diffusion of light in the direction of the exhibition building, and when approach is made from Boylston street or Huntington avenue the sky is lighted as though by a conflagration.

Seen from Copley square, Huntington avenue is ablaze with myriads of incandescent lamps that outline the show building, and on either side of the street to Massachusetts avenue are towering poles that are surmounted by groups of lamps with vari-colored globes that make the thoroughfare as bright as day. Along the back of the hall in letters 20 feet in length hundreds of lamps blaze out "Electric Show," and festoons of lamps extend from the roof to the ground and in graceful designs, following the general contour of the architecture. Along the front of the structure the same general idea is carried out, the porches being defined by the vertical and horizontal lines of lamps,

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and the tower at the north end is shown in outline by lines of twinkling colored lights that instantly attract. Lamps of all colors and all sizes illuminate the street in a manner quite bewildering to the staid Bostonians, and the transition of the usually quiet avenue to the most brilliant of all "white ways" cannot fail to impress one.

While the exhibition building delights and surprises all who have seen it when illuminated, and this spectacle in itself is well worth the time taken to visit the avenue, the most that can be said is that this makes great promise for the visitor. Those who attend through idle curiosity cannot be else than delighted with the innumerable features, but those who have interest will find a visit a decided education in electrical utility. There are few uses for electricity is indispensable, and the Boston Edison company serves 37 towns and cities outside of Boston itself, its light and power lines cobweb an area of 550 square miles, in which dwell 1,500,000 persons, while its plant represents an investment of more than $30,000,000.

So diversified are the uses for electric current, so economical is its utilization, and so large are the possibilities for developing its consumption because of its value for lighting, heating and power, that the show was organized for the purpose of bringing together and displaying all useful and practical electrical appliances and devices to demonstrate their adaptability for varying requirements, and to give manufacturers opportunity to show the practicality of their productions in actual service to those who had or might become interested in them as business propositions.



The Main Aisle to "The Park," the Section of the 1912 Boston Electric Show That Is Devoted to the Display of Pleasure and Service Vehicles.

that are not demonstrated. There are innumerable purposes for which it is available and may be economically utilized that can be realized only through observation of each separate exhibit, and some of these demonstrate processes that evidence the wonderful development in electric applications.

The organization of the exhibition, the financial responsibility of its management and the establishment of its policies, as well as actual supervision, has been and is directed by the Edison Electric Illuminating Company of Boston, and the result is a show that is maintained to be the greatest of the kind ever attempted in America. There are few who realize the magnitude of the business of this great corporation, nor the enormous factor it is in every phase of industrial, commercial and private life. Today electric light

In the organization of the show ample time was taken to insure a full representation of exhibitors. Endeavor was made to create interest in foreign countries, and the event was given publicity in Europe and Japan. For approximately two years the management consistently promoted it, because it was desired that it should be not only complete and comprehensive, but it should represent every practical electrical utility. It was realized that it required time for the preparation of special exhibits, and while scientific advancement was desired when represented by a practical device or apparatus, mere engineering development was not sought.

The management of the show has been directed by H. W. Moses, who has the assistance of Chester I. Campbell, who has been general manager of practi-

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Light Service Vehicles Constitute the Display of the General Motors Truck Company.



The First Atlantic Machine Exhibited at Boston Is a Five-Ton Truck, with a Wagon Expected Later.

cally all of the motor vehicle and motor boat exhibitions held in Boston, as well as having large experience with similar shows in other cities and with differing forms of exhibitions in Boston. It will be realized that the exposition is not only well managed, but it has every feature that will appeal to the public.

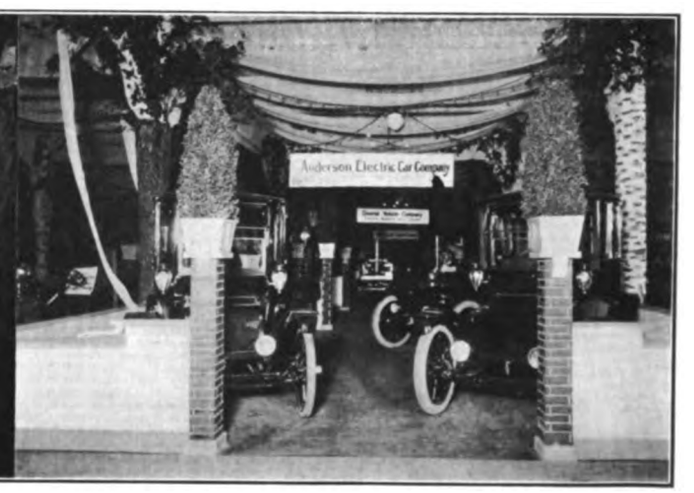
In connection with the show was organized an electrical vehicle department, and this, with the exhibits that are directly connected with vehicle equipment, is maintained to be the largest exhibition of electric carriages, wagons and trucks ever held in America. It is this particular section of the show that is interesting to all persons who are studying, investigating or engaged in highway transportation. In fact at all previous motor vehicle exhibitions the electrics have been subordinated because of the great number of other types, and have been given but incidental attention. The purpose of creating this division was that the builders of electric conveyances would have opportunity for showing and demonstrating the qualities of their machines, and to bring them to the attention of thousands of business men who were desirous of making their enterprises more attractive and consequently more productive.

Though there are now more than 50 different firms and companies engaged in building electric vehicles the industry has not as yet reached a magnitude when it can systematically support and encourage exhibitions intended solely for the promotion of the use of electrics, and it may be further stated that many of the manufacturers have but recently begun production and have not as yet manufacturing capacity to justify exploiting more than a small part of the market of the nation. This being so it is very satisfying to the management of the show and a decided credit to the industry that more than a third of the companies are represented in the exhibition. The department is made the more creditable through the displays of some of the best known battery makers of the country, and in addition to this there are exhibits of vehicle and garage equipment that are in every way interesting.

If for no other reason than to inquire into the possibilities of electric transportation, the 1912 Boston Electric Show has a feature that should appeal to every person, for there is no one who does not directly or indirectly have to bear a proportionate part of the enormous amount that is annually paid for haulage by highway. There are innumerable features that must appeal to thinking people, but these are incidental to



The Exhibit of the Lansden Company Is Composed of Delivery Wagons.



Both Pleasure and Industrial Detroits Are Exhibited at This Stand.

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the general proposition of mechanical vehicles, to the promotion of which the MOTOR TRUCK is devoted.

The show is unusually attractive because of the decorations. These, following a policy that has been accepted with practically every exhibition in Mechanics' building, vary with each department, and the visitor passes from the one section to another and notes with interest the changes in the settings in which the displays are made. To illustrate, entering the building at the north entrance the north section of Machinery hall is representative of a manufacturing section, the effect being the front of a factory building, showing the cement walls and the open windows, the spaces being marked by columns that are surmounted with vases of artificial flowers illuminated with electric lamps. The ceiling is draped with azure blue to represent a sky. Each space is divided by an ornamental rail 30 inches high. In this every exhibit is different.

The south section of this hall is given over to the electric vehicles and it is representative of a park, being separated from the other part of the hall by a solid railing representing a cement wall, the aisle entrances being marked by six large bronzed griffins, each of which supports a flambeau. The spaces occupied by the exhibitors are divided by similar rails with green caps, and at the entrance to the spaces are representations of brick posts surmounted by small square tubs in which are trimmed box shrubs. The rail of the large light well of the hall is covered with a representation of a stone wall overgrown with natural and artificial flowering vines, and from the rail to the apex of the well are suspended festoons of colored lights. This department, however, is not sufficient to show all of the exhibits, and several of the late applicants are to be seen in the basement, close to the model garage.

Grand hall is elaborately decorated to represent a German village and viewed from the castle located on the stage the display is unusually attractive. At the front of the hall is suspended a painted drop that represents a valley in the mountains with a lake and a river between wooded heights, and the ceiling is draped to represent a sky with the roof trusses covered with painted scenery that suggests the arching branches of trees. The band balcony is in sharp relief against the painted drapery on the sounding board, the balcony being decorated with white to suggest a terrace. The upper gallery is shut off by representations of cottages at either side of the hall, the purpose being to exclude all light from without the building. There are four rows of seats in the gallery available for those who desire to rest and to observe the exhibits from a distance. On the main floor the exhibition spaces are separated by rails 32 inches high, and the main divisions are marked by large white columns that support lanterns in which are 500 watt mazda lamps. The stage is given over to the Castle Mazda, which has the arched entrance with a raised portcullis and the traditional turrets and recessed windows, this creation being of papier mache. This department is representative of the electrical interests and the electric supply houses of Boston.



L. D. Gibbs, Superintendent of Advertising for the 1912 Boston Electrical Show.



W. H. Atkins, General Superintendent Boston Edison Illuminating Company.



H. W. Moses, Manager of the 1912 Boston Electrical Show.

In the hall above Machinery hall the front of the section is generally given over to the central stations of New England, a number of which have headquarters to receive visitors and where their representatives await the opportunity to assist and advise those who may be interested in any of the electrical displays. The remainder of the section is occupied by a diversity of exhibits. The spaces are divided by rails and the walls are covered with oil paintings depicting country scenes. The aisles are indicated by large plaster posts that carry 10-inch globes containing large mazda lamps, which constitute the principal illumination of this department. The cafe is decorated to represent a baronial hall, the walls being hung with tapestry and the ceiling being beamed, and the walls are hung with armor, spears, shields and other arms. There is a mam-

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moth fireplace in which are large logs glowing, this being an attractive electrical effect.

The basement in part under the electrical vehicle display is given over to the garage, this being fitted to accommodate about 25 machines. This is one of the features of the exhibition from the viewpoint of the manufacturer, distributor, owner and user of industrial wagons, and it was established with a view of demonstrating the practical and economical methods of caring for and maintaining electric vehicles.

This garage is decidedly ornate for a station in which business is to be carried on, the walls covered with burlap and the space defined by walls of marbleized compos board, with the columns enclosed in panels of the same material. The cleanliness is noteworthy and is in sharp contrast with the machines that are driven in after the day's work on the high-

The station is fitted with the most modern facilities, including a charging board consisting of three panels of six circuits each, four Westinghouse and two General Electric rectifiers, a Wagner rotary charging converter and a General Electric motor-generator set. Besides this there is a wash stand, a bench and the necessary tools for making light repairs.

The work is directed by E. S. Mansfield, who is manager of the Atlantic Avenue Electric Garage, and there is a force of capable workmen in attendance. The vehicles are given systematic attention and are maintained to the standards of the manufacturers, each machine being washed, cleaned, polished, oiled, greased, adjusted and inspected, and repaired so far as the facilities will permit should there be occasion. The work is carried on by a system that is regarded by the management as being sufficient to obtain satis-



The Garage in the Basement of Mechanics' Building, in Which the Proper Care and Maintenance of Electric Vehicles Is Demonstrated to Visitors at the Show.

ways. In this garage is maintained a fleet of wagons and trucks owned by business interests of Boston, that have promoted the show to the extend of garaging their machines there. Practically all of the wagons are kept in different stations, but when the management of the show proposed that a garage be conducted in connection with it, for the purpose of demonstrating the manner in which electric vehicles should be cared for and maintained, the owners unhesitatingly supported it.

The service of the garage was also placed at the disposal of the exhibitors that they might have demonstrating vehicles within instant reach, and benefit not only their customers with this service, but the Boston Edison Company could promote the establishment of public and private garages by demonstrating the possibilities and the requirements as to garage equipment.

factory results from the viewpoint of service.

This garage, its system, its methods, its equipment and its work are open to investigation by any interested person, and visitors are urged to make inquiry and to learn for themselves the facts that experience has developed. The garage is well filled each night and is practically deserted each day, so that the time when the station is most attractive for the visitor is the evening, after the machines have been garaged and the work is in progress.

The work in the garage continues day and night without interruption, and this portion of the exhibition is constant, although visitors do not remain after the usual hour for closing in the evening. The opportunity for obtaining first hand information relative to electric vehicle service requirements cannot be realized until a visit has been made to the station and its

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methods observed. The garage is a means for education that no business man should neglect.

The remainder of the basement is given over to a diversity of electrical exhibits of a general character, and of these not the least interesting is the stand of the Edison Storage Battery Company, where a number of the processes of battery making are demonstrated, component parts of the batteries are shown, the making of nickel plate is carried on with miniature apparatus, a battery is short circuited at will without injury, and the cells of a five-cell battery are raised and dropped by a cam apparatus to show that the batteries are not affected by jolts and jars. In the centre of the stand is a mammoth representation of an Edison battery cell formed by glass in a frame, the whole being illuminated by a lamp of large capacity. The nickel plate production is of great interest, this showing the methods that were devised by Thomas A. Edison at an expense of $1,200,000 to produce the plate

Space	Exhibitor	Address
146	Flanders Manufacturing Co.	Pontiac, Mich.
169-170	General Motors Truck Co.	Detroit, Mich.
157-158-159-160	General Vehicle Co.	Long Island City.
123-126	Lansden Electric Vehicle Co.	Boston, Mass.
139	Ohio Electric Car Co.	Toledo, O.
106-107	Rauch & Lang Carriage Co.	Cleveland, O.
127	Studebaker Automobile Co.	South Bend, Ind.
326-327	Tyler Brothers Corporation	Brookline, Mass.
121	Underhill Company	Boston, Mass.
167-168	Walker Vehicle Co.	Chicago, Ill.
140-145	Waverley Company	Indianapolis, Ind.

The exhibitors of batteries and electric vehicle equipment were the following:

171	American Storage Battery Co., Boston, Mass.
329-330	Edison Storage Battery Co., Orange, N. J.
108	Electric Storage Battery Co., Philadelphia, Penn.
109	Gould Storage Battery Co., New York, N. Y.
1-2-3-4	General Electric Co., Schenectady, N. Y.
26	Holtzer-Cabot Electric Co., Brookline, Mass.
105	Philadelphia Storage Battery Co., Philadelphia, Penn.
421	Wagner Electric Manufacturing Co., St. Louis, Mo.
13	Western Electric Co., Boston, Mass.
15-16-19-20	Westinghouse Electric & Manufacturing Co., East Pittsburg, Penn.

The following were the exhibits of vehicles shown:

Anderson Electric Car Company—One runabout, one coupe,



The Stand of the General Vehicle Company, Showing the Highway Transports and the Several Forms of Industrial Conveyers for Shops and Mills.

in quantities for the manufacture of the Edison batteries. All the machines utilized are built specially for the purposes used. Still another display by Thomas A. Edison, Inc., is worthy of attention, this including a "home kinetoscope," a new disc talking machine, a dictating machine and a primary battery, all of which have been practically developed by characteristic Edison energy and methods.

In the motor vehicle park there are 16 different exhibits of machines, with one in the basement, making a total of 17 when the show was opened. These displays are as follows:

Space	Exhibitor	Address
141-144	Anderson Electric Car Co.	Detroit, Mich.
166	Atlantic Vehicle Company	New York, N. Y.
142-143	Bailey & Co., Inc., S. R.	Amesbury, Mass.
108-124-125	Baker Motor Vehicle Co.	Cleveland, O.
155-156-161-162	Buffalo Electric Vehicle Co.	Cleveland, O.
100-101	Century Electric Car Co.	Detroit, Mich.

one brougham and one 1000-pound delivery wagon.

Atlanta Vehicle Company—One one-ton wagon chassis and one five-ton truck chassis.

Bailey & Company, Inc., S. R.—Three runabouts.

Baker Motor Vehicle Company—One victoria, one brougham, one 1000-pound wagon chassis, one ambulance on a one-ton truck chassis, one general service wagon on a runabout chassis, one two-ton truck chassis and one two-ton truck with express body.

Buffalo Electric Vehicle Company—One runabout and two coupes, one of the coupes being fitted with wire wheels.

Century Electric Car Company—One coupe and one brougham.

Flanders Manufacturing Company—One colonial coupe.

General Motors Truck Company—One one-ton chassis that has been driven 1500 miles in testing, one three-ton truck with covered express body and one 16-passenger omnibus on a one-ton chassis.

General Vehicle Company—One 750-pound wagon chassis, one electric crane truck for industrial service, one coal truck for the Boston Manufacturing Company fitted with a dumping body, one two-ton wagon with covered body for the Pureoxia Company, one two-ton wagon chassis and one five-ton truck chassis for the Massachusetts Breweries.

Lansden Electric Vehicle Company—Two 1000-pound delivery wagons with enclosed bodies and one one-ton wagon.

Ohio Electric Car Company—One colonial coupe.

Rauch & Lang Carriage Company—One landaulet and two broughams.

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Studebaker Automobile Company—Two 1000-pound delivery wagons, one of which has been in the service of the Christian Science Monitor for three and a half years, and a three-ton truck with platform body.

Tyler Brothers Corporation—One runabout and two coupes and one brougham.

Underhill Company—One Grinnell coupe.

Walker Vehicle Company—One runabout, one one-ton chassis, one two-ton chassis and one one-ton delivery wagon with enclosed body.

Waverley Company—One 750-pound delivery wagon and two coupes.

The Philadelphia Storage Battery Company made a very interesting display of the Philadelphia thin plate batteries, which were shown in sectional form for the purpose of demonstrating the decrease of weight and the increase of capacity by the use of these plates, and to show the construction of the cells.

The Electric Storage Battery Company exhibited a number of the different types of batteries produced, these including both thin and thick plate cells, and for use in vehicle, lighting and ignition batteries.

The Gould Storage Battery Company made a show of the Gould batteries for both vehicle and lighting service.

The exhibition of the American Storage Battery Company was of cells designed for ignition and lighting purposes, principally for automobile service.

The Holtzer-Cabot Company showed electric lighting and ignition systems and devices for the regulation of electrical current. This display was very comprehensive and interesting.

The exhibits of the General Electric, Wagner Electric Manufacturing, Western Electric and the Westinghouse Electric & Manufacturing companies were largely of devices for controlling and regulating electrical installations, some of which were suited for garage service.

In connection with the 1912 Boston Electric Show the Electric Vehicle Club of Boston is constantly represented, it having an office in the garage in the basement, where representatives of the organization may be found and where all information pertaining to electric vehicles and electric vehicle transportation will be placed at the service of all inquirers.

The fourth annual convention of the New England Section of the National Electric Light Association will be held in Paul Revere Hall, in Mechanics' Building, October 15-17, with sessions at 10 in the morning and 2 in the afternoon of each day. The report of the officers and the address of President J. S. Whittaker of Portsmouth, N. H., will take place the opening session, and during the five succeeding sessions seven papers will be presented, the concluding one to be "Co-operation Between the Central Station and the Motor Manufacturer," by J. M. Tomb of the Westinghouse Electric & Manufacturing Company, Boston, Mass. The election of officers will take place the final session. The first evening the members will be entertained at a dancing party, the second evening they will visit the electrical show, and a banquet will conclude the convention.

The third annual convention of the Electric Vehicle Association of America will take place at Paul Revere Hall October 8 and 9; the annual business meeting and the election of officers will take at the opening session. The meetings will be begun at 10 o'clock daily and one afternoon and one evening will be open that the delegates and guests may accept the invitation of the Boston Edison Company to attend the 1912 Boston Electric Show and participate in other entertainment arranged by the committee. The arrangements have been in charge of a committee of 36 headed by Chairman E. S. Mansfield.

The following is the programme of the convention:

TUESDAY SESSION.

President's address—President C. E. Blood, Boston.
Reports of committees.
Regular business and election of officers.
"Where We Stand Today"—C. E. Michel, Union Electric Light and Power Company, St. Louis, Mo.

"Street and Traffic Conditions as Applied to the Use of Electric Vehicles"—R. McAllister Lloyd, International Motor Company, New York, N. Y.

"The Publicity Campaign of the Electric Vehicle Association of America"—Frank W. Smith, United Electric Light and Power Company, New York, N. Y.

"The West as a Field for Electric Vehicles"—Dr. M. Ekstromer, Denver Gas and Electric Light Company, Denver, Col.

"Notes on the Cost of Motor Trucks"—Dr. Harold Pender

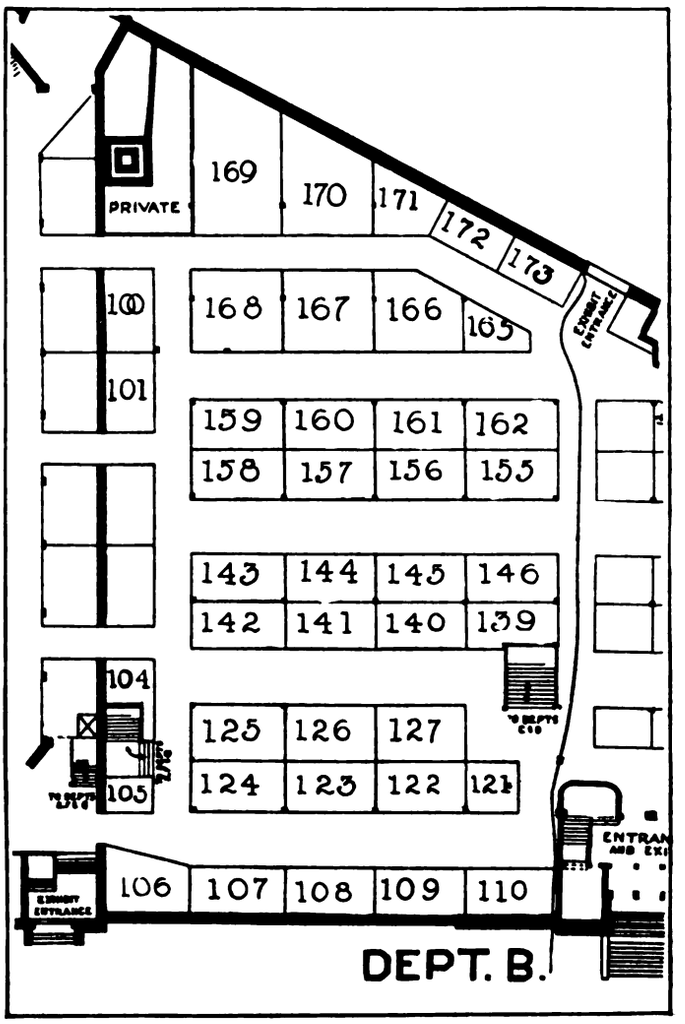


Diagram Showing the Location of the Exhibits in the Main Electric Vehicle Display.

and H. F. Thomson, Massachusetts Institute of Technology.

"Some Recent Developments in the Lead Battery"—Bruce Ford, Electric Storage Battery Company, Philadelphia, Penn.

WEDNESDAY SESSION.

"Electric Vehicle Development in the East"—Stephen J. Thompson, Public Service Electric Company, Newark, N. J.

"Electric Vehicle Charging Apparatus"—R. E. Russell, General Electric Company, Schenectady, N. Y.

"Progress of Commercial Cars in America, with Special Reference to the Electric"—E. S. Foljambe, Commercial Car Journal, Philadelphia, Penn.

Paper by Westinghouse Company.

"Insurance from the Standpoint of Electric Vehicles"—Carl H. Clark, Field & Cowles, Insurance, Boston, Mass.

"The Edison Storage Battery in Service"—H. H. Smith, Edison Storage Battery Company, Orange, N. J.

"Electric Vehicle Service"—J. C. Ford, National Electric Lamp Association, Cleveland, O.

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NEW YORK ELECTRICAL EXPOSITION.

THE sixth annual New York Electrical Exposition and Automobile Show will be opened in Grand Central Palace, 46th street and Lexington avenue, the evening of Oct. 9 and will be concluded the night of Oct. 19, covering a period of 10 days. The exhibition will be opened by Thomas A. Edison, who 30 years ago inaugurated the service of the world's first "central station" for the generation of electric current for distribution for commercial use. This event will be memorable because it will demonstrate the wonderful progress made in three decades. That first station, which Mr. Edison helped to build and equip, produced current for about 400 incandescent lamps, all within an area of less than a half mile, which was not sufficient to light a single floor of a modern office building. This was the origin of the New York Edison system, which has always been the largest and finest in the world—the standard by which Europe and America measure the efficiency of illuminating service.



Grand Central Palace, New York, N. Y., Where the Annual Electrical Exposition and Automobile Show Will Be Inaugurated Oct. 9.

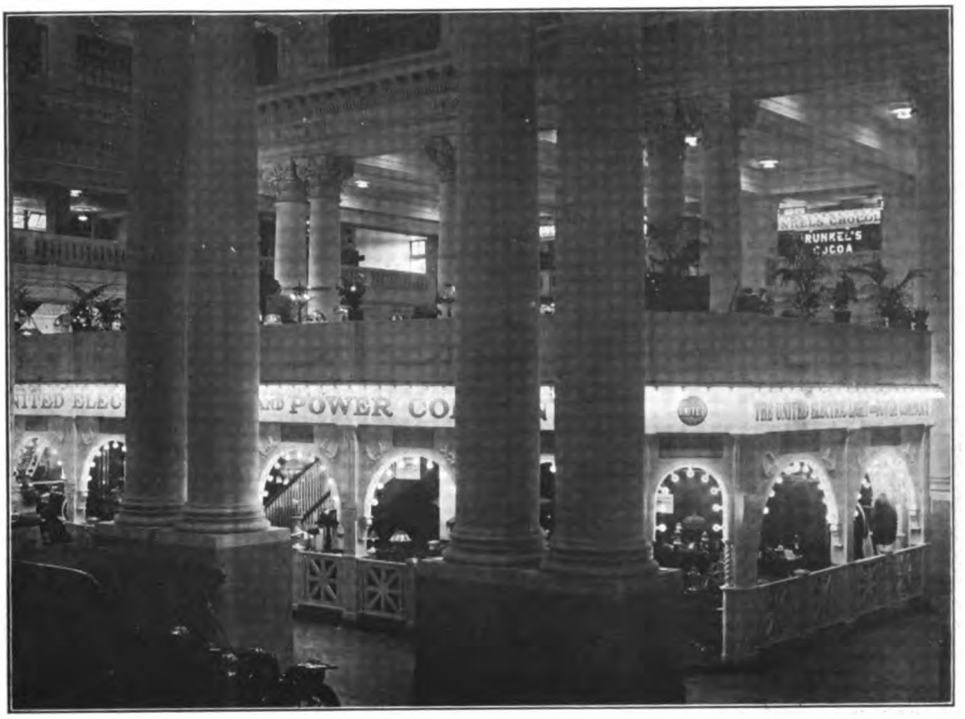
Where the first "central station" was established is now the site of a part of the mammoth twin structures used by the New York Edison Company as executive, administrative and maintenance headquarters, these buildings each covering a city block. The central station of the company now covers two blocks on the East river and from it current is sent out that furnishes light and power for the 62 square miles of area of Manhattan and the Bronx. The high-tension current is converted at 31 sub-stations to low voltage for the 129,000 customers of the company, and the lamps now number about 5,850,000, and with the current required for power there is daily generated what is equivalent to 11,500,000 lamps.

This wonderful progression will be demonstrated at the show by hundreds of exhibits that will interest every person. Electric energy, seemingly a dream of the man who will open the 1912 exhibition, has revolutionized the industries of the world and it is now as essential to industry and commerce, to the every phase of civilization, as the atmosphere itself. It has been said that when Edison placed in operation the Pearl street central station he made possible the modern city, which is but half the truth. Manufacturing, arts and sciences would never have been developed as they have been were it not for the incandescent lamp. Rapid transit would have still been dependent upon other forms of energy, and the great resources of the rivers and lakes would not have been developed as they now are to produce light, heat and power.

Despite the practical means for producing electricity its utility would not have been realized had not the manufacturers of current interested American ingenuity and demonstrated the possibilities. A score of years ago electric current was regarded as a commodity and was sold to those seeking it. Then Arthur Williams assumed the direction of marketing the sale of current. He realized the possibilities and began to educate the people to the use of electric energy, proving its economy, cleanliness, convenience and comfort, and this work has given to the civilized people of the world a wonderful control of this intangible, invisible, yet marvelous force. From this beginning the present-day utilization of electricity has developed. In every phase of life electrical energy is today used with the greatest success.

The exhibition itself will be the largest and best ever seen in New York, and in addition it will have a department devoted to electric vehicles that will have quite as much interest to the visitors as any of the other displays. In this will be shown a considerable number of both pleasure and service machines, and these will be the products of some of the best known manufacturers in the industry. While it may be said

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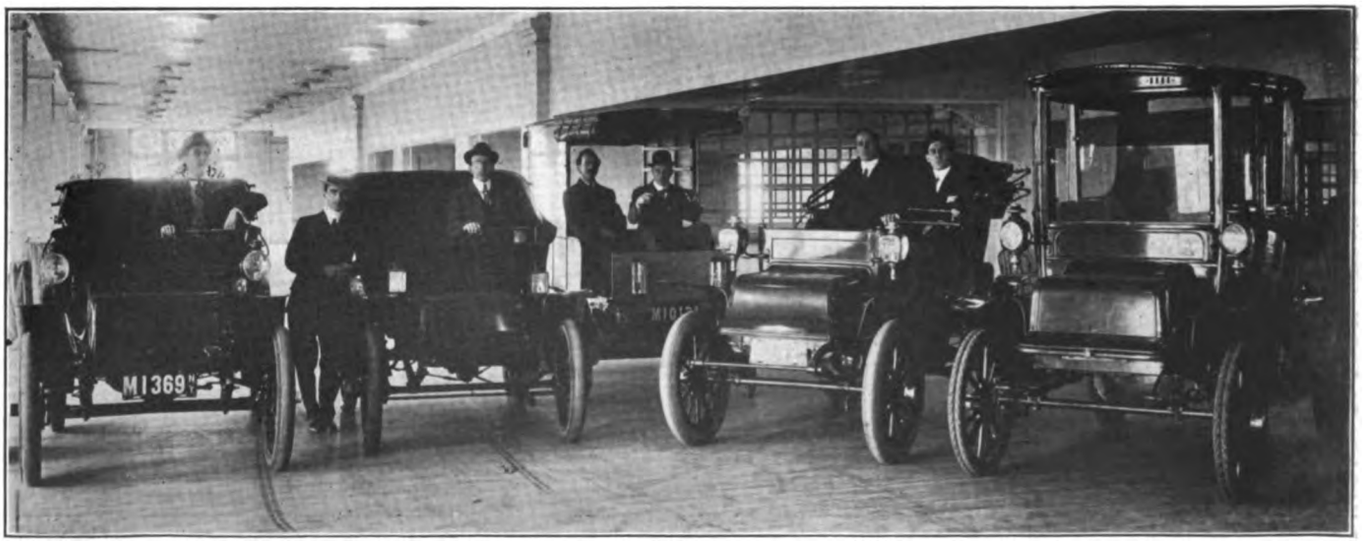
The Main Floor of Grand Central Palace as Illuminated and Decorated for the Electrical Exhibition of Last Year.

that these are recognized productions it is also a fact that many of the vehicles are to be delivered to purchasers and represent the creations for genral and special service.

In all there will be about a third of the electric vehicle industry represented among the exhibitors, and besides these there will be a number of makers of batteries and in the general displays will be shown innumerable devices suited to the control and regulation of electricity and adapted to the equipment of machines and private and public garages. A decided feature will be made of the vehicle exhibits, which will be shown on the main or second floor of the building, and these will be both chassis and fully equipped machines. These stands will vary in size and some will show both the pleasure and service conveyances, as the two classes have not been separated. This, however, is not an occasion for criticism. As a matter of fact it is a condition that is to be commended in a show of this character, as opportunity is afforded to every visitor to examine the machines, and they form no inconsiderable part of the exhibition, when measured by space occupied and prominence through location.

On the upper floor of the section of the building devoted to the exhibition is to be the actual demonstration of pleasure vehicles. Here, as at the show of 1911, is to be the demonstration track, where those who are desirous of learning from personal experience the qualities of the machine when in operation may drive or be driven in cars of differing types. This track is to be 20 feet in width and a single circuit is a tenth of a mile, so it will be seen that quite a number of vehicles may be demonstrated at one time. The track will be outlined by a boxwood hedge and back of it will be palms and shrubbery, and with the windows open there will be quite as much pleasure as when riding in the open air. Near the track will be four charging boards for re-energizing the batteries, so that there need be no cessation of demonstrations from exhaustion of the batteries.

The vehicle exhibitors have been asked to suggest features that will attract the visitors to the track and retain their interest. Mrs. Alice E. Waxham, who is well known as an expert driver of electric machines, will serve as an instructor for the ladies who desire driving knowledge. The instruction will first be given with a car mounted on what may be termed a



How the Vehicles Are Utilized for Exhibition and Demonstration Purposes, and Are Later Shown in Motion on a Track.

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Arthur Williams, President of the New York Electrical Exposition and Automobile Show, and President of the New York Electric Vehicle Association.

"tread mill," so that the car will be actually operated, though motionless, and the pupil can practically obtain knowledge of operating the control levers, the brakes, starting, stopping, reversing and other essential detail until confidence is established. The next lesson will be in driving on the track under the supervision of the instructor, and the third will include driving the car on an elevator and taking it to the street, where experience will be in differing degrees of traffic.

The track, the demonstrations, and the work of the vehicles will be directed by the New York Electric Vehicle Association. This organization has carefully systematized the practical showing of the vehicles, and it is expected that there will be a very large measure of success. Of course the show will be a centre for those who are studying and investigating transportation problems and the association will have available all facts that may be valuable to inquirers.

Besides the road vehicles there will be shown differing forms of industrial trucks that may be utilized in shops and mills, and which have been devised with a view of obtaining the same economy of work in the handling of materials and stock in different stages of production.

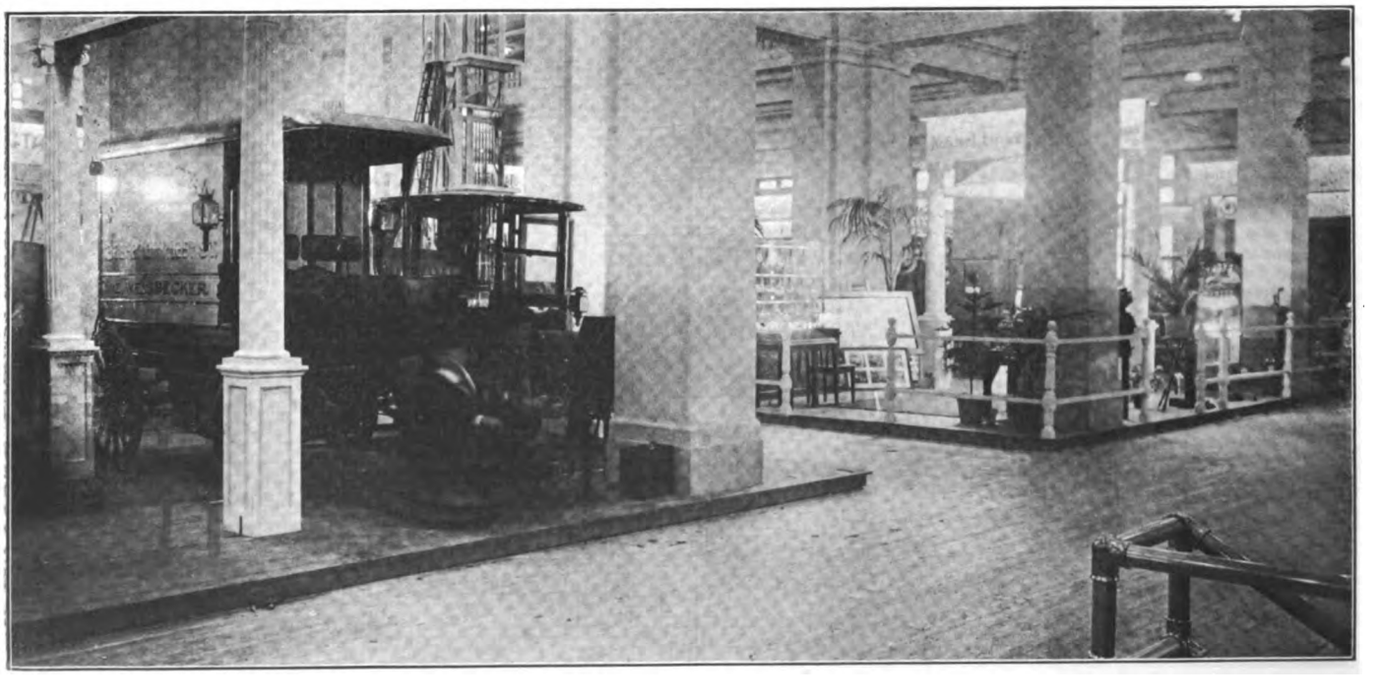
The exhibitors of electric vehicles will include the following:

Space	Exhibitor	Address
88	Atlanta Vehicle Company	New York, N. Y.
79	Anderson Electric Car Company	Detroit, Mich.
30-31	Baker Motor Vehicle Company	Cleveland, O.
56	Bailey & Company, Inc., S. R.	Amesbury, Mass.
57-59-61	Buffalo Electric Vehicle Co.	Buffalo, N. Y.
36	Champion Electric Vehicle Co.	Oswego, N. Y.
14	Cleveland-Galion Company	
62-63	General Motors Truck Company	Detroit, Mich.
45-46	General Vehicle Company	L. I. City, N. Y.
34-35	Lansden Company	Newark, N. J.
82-83	Studebaker Automobile Co.	South Bend, Ind.
8	Ward Motor Vehicle Company	New York, N. Y.

These concerns will make display of vehicle, lighting and ignition batteries, and processes entering into their manufacture:

Space	Exhibitor	Address
77	Edison Storage Battery Co.	Orange, N. Y.
58-60	Electric Storage Battery Co.	Philadelphia, Pa.
40	Gould Storage Battery Co.	New York, N. Y.
74	Philadelphia Storage Battery Co.	Philadelphia, Pa.

The attractions in the other departments of the show will be of great interest and these will include the exhibits loaned by the United States War, Navy, Commerce and Labor and Agriculture departments, and the Bureau of Mines. Besides there will be demonstrations of uses for electricity in manufacturing, science, arts, household and domestic service, office and labor saving devices, sick room supplies, hospital appliances, refrigerating, ice-making, automatic cooking, water heating, hotel equipment and for all manner of signs and novelties.



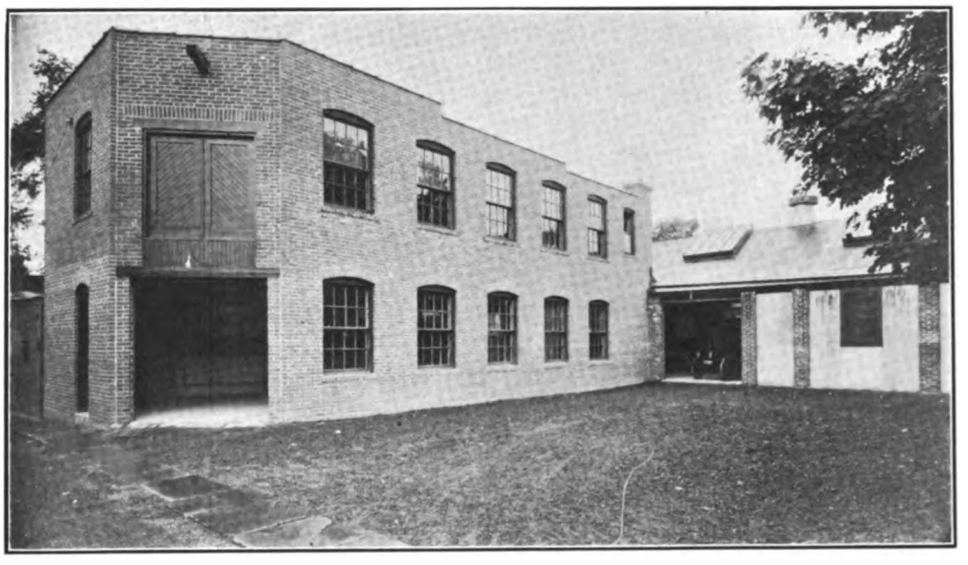
A Section of the Main Floor of the Grand Central Palace, Where the Main Display of Pleasure and Service Vehicles Will Be Seen.

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CENTRAL STATION PUBLIC GARAGE.

Hartford, Conn., Electric Light Company Promotes Vehicle Use by Practical Methods and Has Inaugurated a System of Battery Service on a Mileage Rental Basis That Eliminates Maintenance and Attention by the Owner.

THE Hartford, Conn., Electric Light Company is engaged in the promotion of the use of the electric vehicle in urban delivery service because the management of the corporation believes that the development of this form of transportation offers very large opportunities for the sale of current during the off-peak period of the day, and it is confident that with reasonable use this form of mechanical vehicle is very economical. The example of this company can profitably be made the subject of study and investigation by every other public service station in America, and there are well nigh 30,000 companies now selling light and power. In this promotive work the company has been especially energetic, and not only does it furnish light and power and current for charging, but it maintains a public garage for electric vehicles, it specializes the maintenance and restoration of all forms of vehicle and lighting and ignition batteries, and in addition it is the agent for Hartford and vicinity for General Vehicle wagons and trucks. Not only this, the company has just announced a new policy in selling battery service, in which the customer is assured practically an unlimited use of batteries, he paying an initial charge for the privilege and a mileage rate for the number of miles that his vehicle or vehicles are driven by the batteries, always having at his disposal a freshly charged battery, and making as many changes as the requirements of his business necessitate.



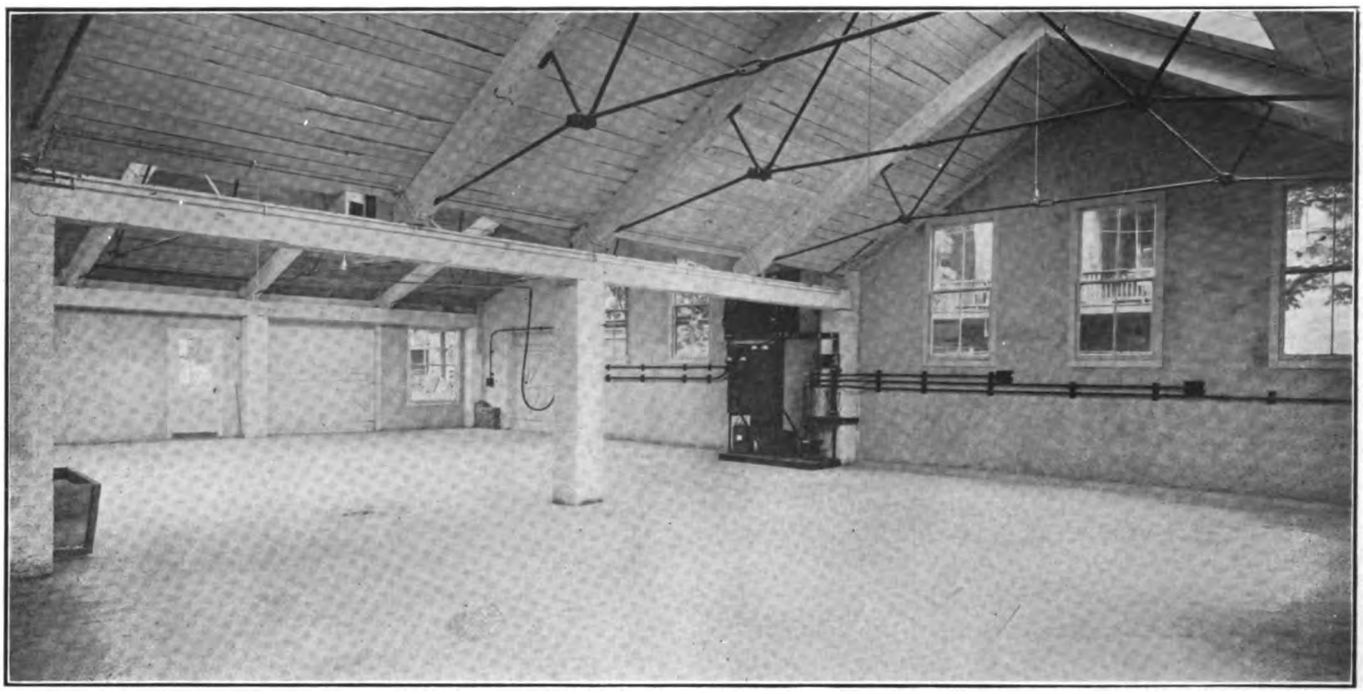
The New Public Service Station of the Hartford Electric Light Company in Main Street, Nearly Ready for Occupancy.

This in brief outlines the business the company desires and what it has undertaken, going to what may be regarded as extremes by those who have less enthusiasm and optimism, and yet this policy is founded on what may be considered to be mature experience and ample knowledge of the electric vehicle market. From the standpoint of the company, however, there is every reason why it should stimulate the use of electric current, and with abundant confidence in electrically driven wagons or trucks it is prepared to exploit their use as it promotes the utilization of electricity for any other purpose.

When the Electric Vehicle Company began to produce electric pleasure machines in Hartford the attention of Hartford people was naturally directed toward them because of obvious reasons, and President H. C. Dunham of the Hartford Electric Light Company became interested from the fact that his company was required to provide current for charging those owned by residents of the city. Eventually a Mark XII runabout, a vehicle with a 40-cell battery, was purchased, and this was used by the officers of the company and it served to demonstrate the utility of the machine,, as well as giving the officials some especially desirable experience in battery maintenance and attention. The runabout was delivered early in 1899, and while it was a very satisfactory vehicle at the time, it was heavy and slow when contrasted with the machines of today, and the workmanship and the design was crude when comparison is made with present day design.

At that time electric vehicles were practical, but there were lacking many of the qualities which have been developed with experience and incorporated in the machines of modern type, for 12 years is a long time when measured by progression of electrical engineering. After experience with the runabout for a short time the company purchased its first service wagon, this being a ton Riker, and later on added another wagon of the same size and make. Both of these were placed in general haulage and gave excellent satisfaction, and in 1900 the company was delivered a two-ton Riker wagon. From time to time three other Mark XII Columbia runabouts were purchased from the Electric Vehicle Company, and by 1901 the

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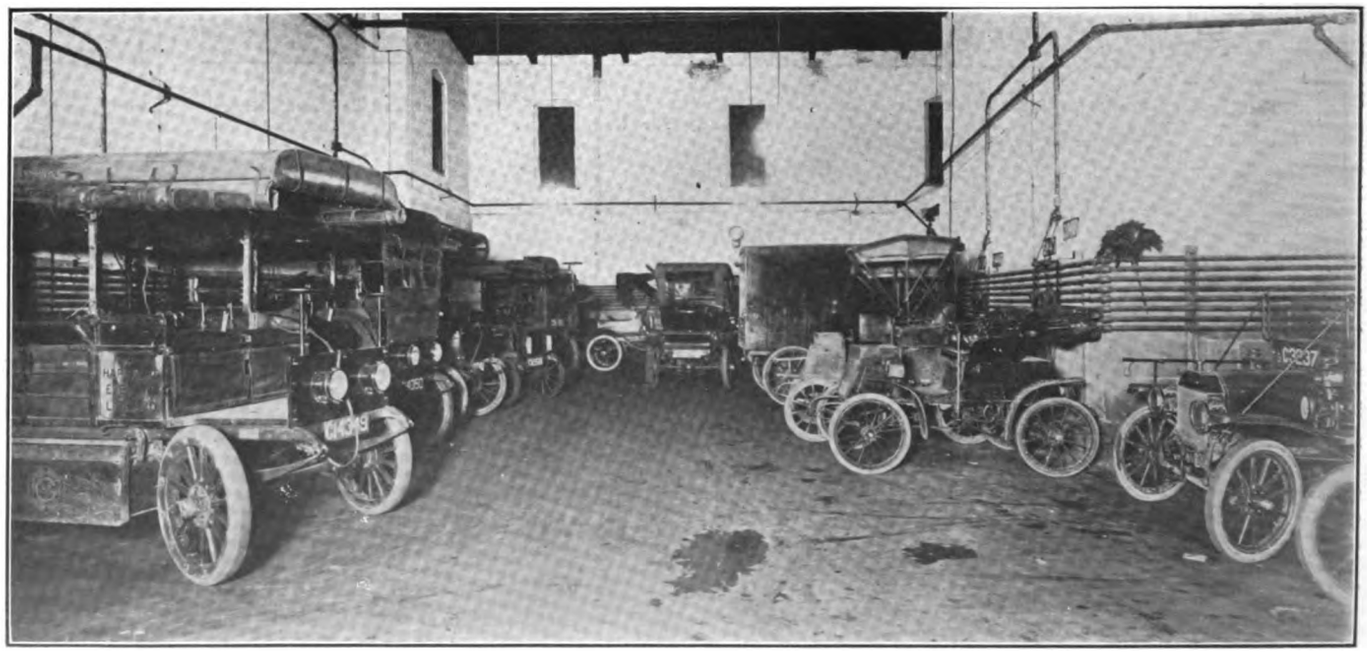


Main Floor of the New Main Street Station of the Hartford Electric Light Company.

four runabouts and the three wagons were in constant use. The runabouts were used by four officers of the company in the transaction of business, and the wagons were utilized for haulage and construction. Within a comparatively short time a 1500-pound Riker panel body wagon was added, and in 1902 a Waverley machine was placed in service, but the latter was used but a comparatively short time.

With this service of eight or nine electric vehicles a considerable part of the work was done without animals, and about this time the company engaged in the production of the Barhoff storage battery, a secondary battery that is stated to possess peculiar qualities, and while these were not built commercially they were used for a number of years, and some are now in use. These batteries were claimed to have remarkable qualities of endurance, and considerable attention was given to experimentation and development. While the battery building was not with a view of specialization in battery attention and maintenance there is no doubt that the experience gained has proven to be of decided value to the company.

In 1903 the company bought three more small Riker electric wagons, two of which were used for mail transportation during the progress of the Buffalo Exposition, and were later brought to Hartford and were used in the service of the company. Several changes were made from time to time and an aver-

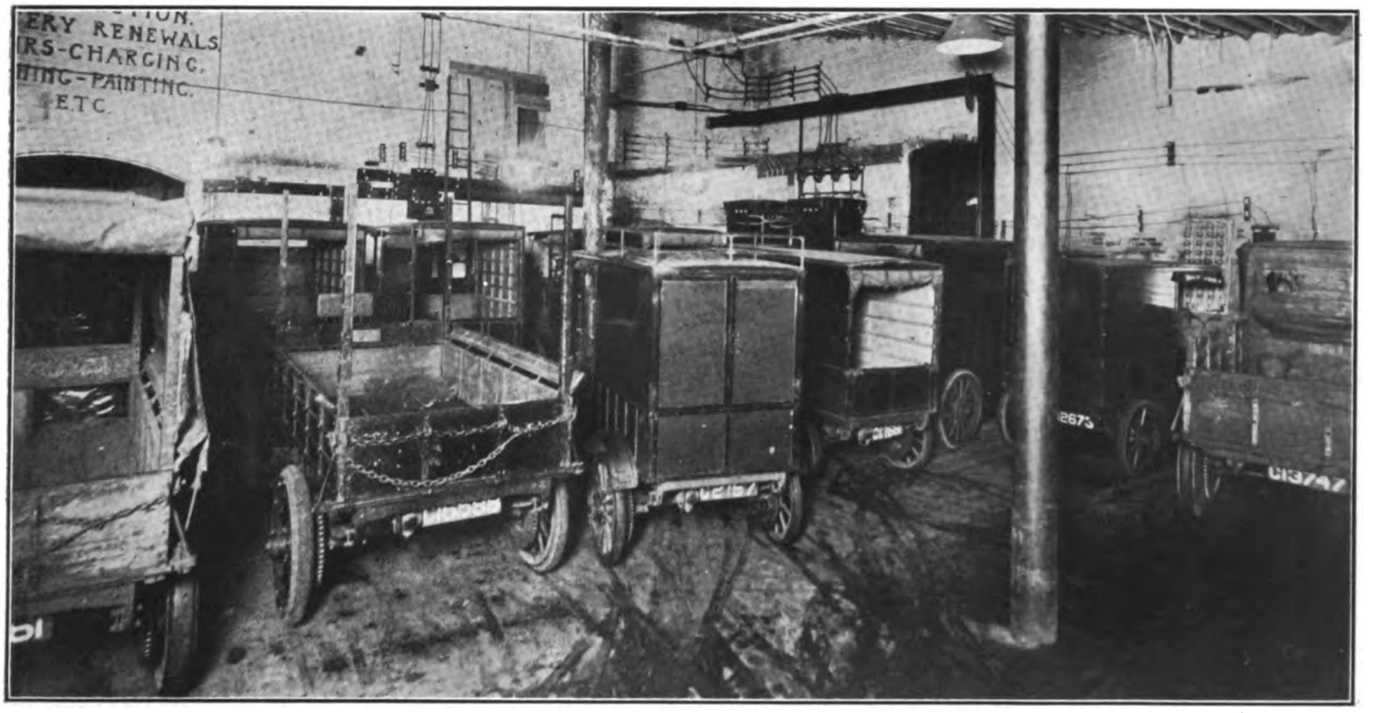


Interior of the Garage at the Pearl Street Station, to Be Used Exclusively for the Service Vehicles of the Hartford Electric Light Company.

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age of about 10 machines were in use until 1905 or 1906. It was necessary for the company to establish a garage for the care of its own equipment, and this was first at the State street station, where the batteries were built and the equipment was installed for the charging of the batteries. This led to the creation of a battery department, which has been for more than 10 years in charge of W. M. Thayer, who also directs the transportation of the company. In 1903 a Columbia wagon was installed and used in construction work, and later on the original Columbia runabouts were replaced by more modern machines, there being now four of these vehicles in use. Though not as fast and much heavier than the later productions these Columbias have given a large measure of satisfaction, being used for differing purposes.

The lines of the company extend in a radius of from 12 to 15 miles from Hartford, there being stations at



Section of the Main Floor of the Kinsley Street Garage of the Hartford Electric Light Company, Soon to Be Utilized for Other Purposes.

Tariffville, Windsor, East Hartford, West Hartford and Wethersfield, as well as the local plants, and lines for power run to Dividend and to South Manchester. The company has two water power stations, the remainder being steam. Both power and lighting require attention to all these lines and at all hours of the day and night. The peak load is about 4:50 in the afternoon. Covering the area that it does the demands of the company necessitate the use of a considerable number of vehicles for differing construction and maintenance service. The garage was equipped with charging panels and the facilities for caring for the machines, and for a considerable period much of the repairing was done by the workmen. In this garage the city of Hartford's Columbia ambulance and police patrol wagons were kept so long as they were in service. From 1901 to 1907 the Columbia electric omnibus of the Hotel Hueblein was also kept there, the vehicle being supplied with the Barhoff batteries when renewals were necessary. The original batteries were with the thin Manchester form of positive plate and the chloride negative plate, made by the Electric Storage Battery Company.

From 1905 to about 1910 the company did not add to its electric vehicles, working those it owned, but using gasoline machines for the lighter work and employing the Riker wagons for the haulage. It was not until November, 1910, that it delivered the first General Vehicle wagon to the Boston Branch Grocery, a concern that had in its service 25 or more horses and had used animal delivery exclusively until that time. The officials of the company decided that it would be well to promote the sale of electric vehicles and as the agent for the General Vehicle Company engaged actively in a selling campaign, this being under the direction of Mr. Thayer. Incidentally this sale to this company has been followed by orders for eight more of the same type, four of which are yet to be delivered, and this concern has also a 1000-pound Detroit delivery wagon and a 3000-pound Waverley wagon, the latter being used for hauling freight to and from Warehouse Point. It was the sale of these machines that formulated the policy of the company to establish a public garage, for its customers and others owning electric vehicles demanded a station where they could receive a satisfactory service, not being willing to accept the facilities of other public stations as sufficient for their requirements. In other words they did not care to be dependent upon pleasure car garages when business necessities compelled their machines being serviceable at all times.

First a building that had been utilized for a boiler

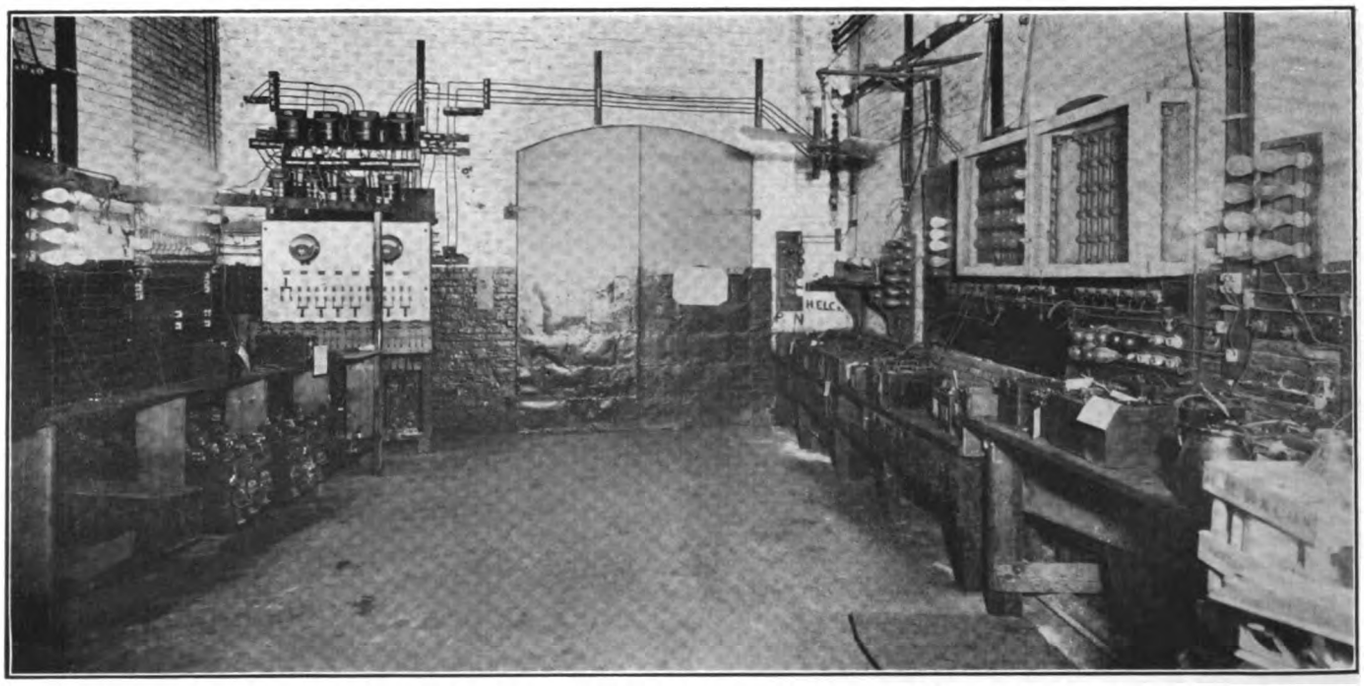
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house at the Pearl street station was equipped as a garage, and at this was maintained all of the machines owned by the company, and this left the Kinsley street (or the State street) station garage open for the use of the owners of electric wagons and trucks who desired a public service. The Pearl street garage is limited by floor space to about 20 vehicles. The charging board is located in a gallery. Naturally, its equipment is excellent.

The battery department at the Kinsley street garage, which was also finely equipped, was given over to work on all batteries, and in connection with this a renting system was established so that automobile owners may obtain for a stated sum paid weekly either an ignition or a lighting battery, having the privilege of returning an exhausted battery and obtaining one completely charged as often as desired. That is, for the subscription price the service is guaranteed for whatever form of battery is required. In connection with this department, the outgrowth of the battery building division, vehicle batteries were given attention, maintained and charged.

The company took delivery of its first General Vehicle wagons June 10, 1910, these being two 2000-pound and one 1000-pound wagons. Just previous to this time the company was using two of the Riker wagons, these having been in service since 1900. One of the Riker wagons was retained, this being a two-ton machine, and since that time two more 2000-pound, one 1000-pound and two 750-pound wagons have been added to the equipment, all of the G. V. make, and two 1000-pound Detroit wagons have been bought. Besides these the company is still using the two-ton Riker wagon, for which a new battery has just been ordered, and three of the Columbia runabouts, making a total of 14 electric vehicles. The large wagons are used for construction work and one of the small machines is used as a lamp wagon and as a trouble wagon. In addition to these six gasoline runabouts are employed, all of them small machines.

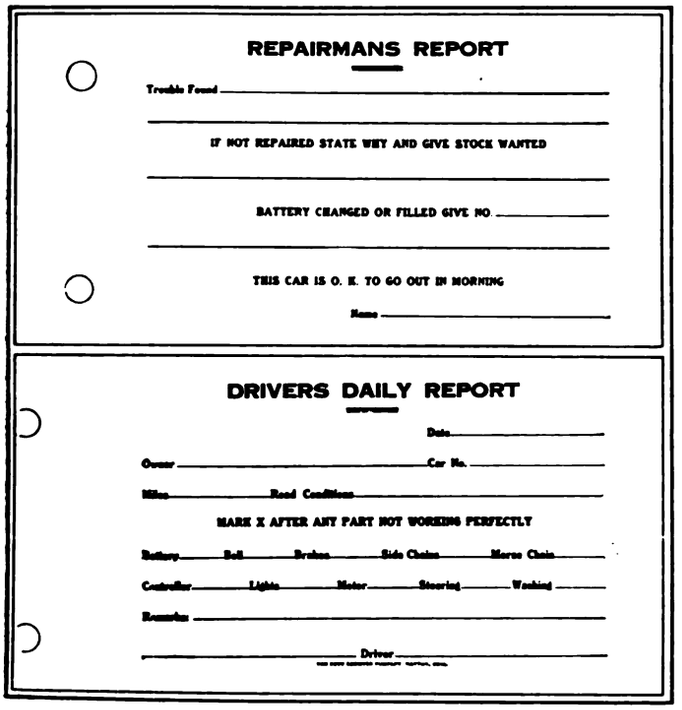
This season the company decided to erect a public service station and it built a fine brick building, a portion of it two stories, with brick floors, conveniently located off Main street, which has a capacity of 20 machines, but there is ground area available so that the building may be increased to have a capacity for 100 should the need develop. This garage is not as yet used, but when the charging board is installed it will be opened and in the course of a month it will be ready for the accommodation of patrons. It will have a combination charging board of 12 panels and every modern facility. Then the Kinsley street garage will be devoted to battery work and caring for demands in excess of the facilities at the Main street station.



Battery Room of the Hartford Electric Light Company at the State Street Station, Where Batteries of All Kinds Are Given Attention.

The company has contracted for a number of Edison batteries and it is proposed to sell wagons and trucks without batteries, the customer to pay an initial or service charge, and then to have the use of a battery whenever it is needed, there being a mileage rate established so that the customer need give no thought to battery maintenance or expense. The company will receive a rental for the battery and it will supply the current, and as frequently as desired the battery may be changed. If the customer uses batteries constantly so much the better, but with this system there must be reasonable use, as the company cannot contract to furnish occasional service. Special equipment will be installed for the shifting of batteries quickly. There is a demand for this service, which was developed last winter when a customer with an electric wagon averaged from 65 to 75 miles daily through the winter, on one occasion reaching a mile-

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REPAIRMANS REPORT

Trouble Found _____

IF NOT REPAIRED STATE WHY AND GIVE STOCK WANTED

BATTERY CHANGED OR FILLED GIVE NO. _____

THIS CAR IS O. K. TO GO OUT IN MORNING

Name _____

DRIVERS DAILY REPORT

Date _____

Owner _____ Car No. _____

Miles _____ Road Conditions _____

MARK X AFTER ANY PART NOT WORKING PERFECTLY

Battery ____ Belt ____ Brakes ____ Side Chains ____ Morse Chain ____

Controller ____ Lights ____ Motor ____ Steering ____ Washing ____

Remarks _____

_____ Driver _____

Driver's Daily Report, Made in Duplicate on Lower Blank, the Copy Having the Upper Blank on the Reverse. Original Goes to Owner and the Copy to the Night Foreman, Who Makes Repair, or Reports Why Repair Cannot Be Made. Printed on White Paper, 8.5 Inches Width and 4.5 Inches Length, Perforated for Loose Leaf Binding.

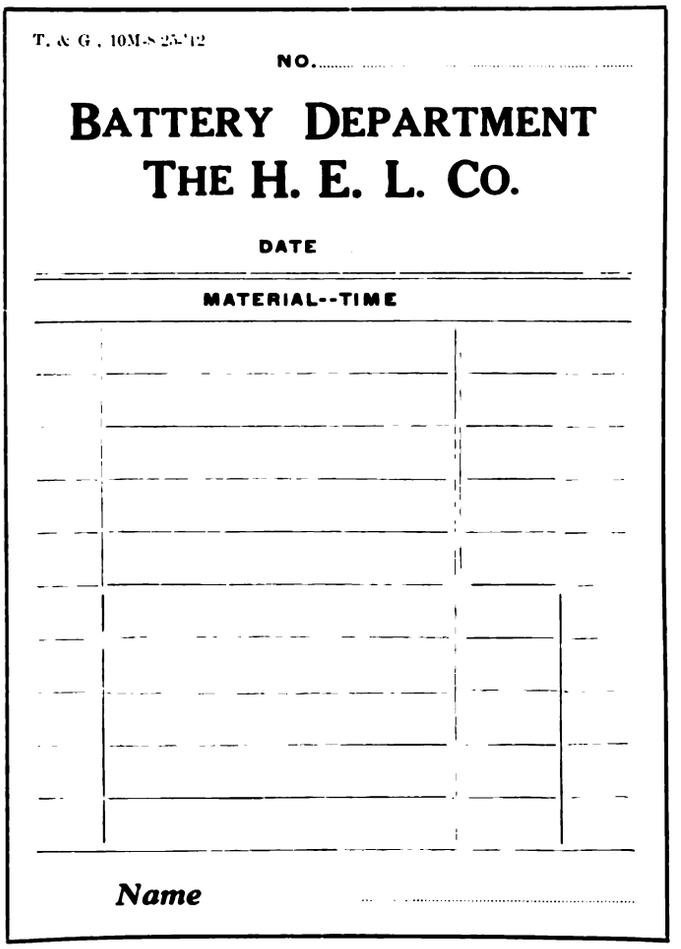
age of 78. With the battery changing plan the more the vehicles are used the cheaper becomes the rate for current, which is charged for usually at the rate of four cents a kilowatt-hour. In connection with this service the battery department will give attention to all classes of acid batteries and will maintain them as the customers may desire. The exchange system, however, will apply only to the Edison batteries.

The company has given the garage problem much study and attention and would prefer that the customers would have their vehicles washed, oiled and greased by their own men, because it has up to the present time charged a flat rate for monthly garaging, to which it added the cost of the current used. This rate provides for washing, polishing, greasing, oiling and the care of the batteries, as well as minor adjustments. Inspection is also given the machines when requested, this being a service satisfying the customers and insuring to them a better degree of utility. As the garage has been over-crowded for a considerable period, there being about 25 machines under supervision, work has been done under conditions that are decidedly a handicap. It is believed, however, that some of the customers will eventually establish their own garages, which will afford a relief.

In the sale of the electric machines great care is taken to insure figures that will be practical and conservative. Usually a delivery service is investigated and after study a demonstrator is set at work and from the figures obtained from actual work the prospect is given information that is decidedly reliable and based on the requirements of the business. This entails close examination of the factors entering into the particular case under consideration, and the inquirer obtains facts that are often surprising, for unusual reasons for waste and some peculiar conditions that should be changed for greater economy are occasionally disclosed.

The sales department of the company is always at the disposal of those who are desirous of improving their own service. The belief is that no conditions are alike and it would be injudicious to attempt to base an estimate for work or cost on the experience of another. Carrying out this idea the desire is to advise the probable customer where it is possible and how it is practical to use electric vehicles and with the largest economy that is evidenced by the demonstrations.

The system of the public garage is simple and is said to be exceedingly satisfactory. As stated there is a flat rate charged for the service, to which is added the cost of the current used, as well as the labor and material in making any repair. When a wagon or truck is garaged on a monthly basis it is not tagged for identification, but is identified by the owner's name in the garage, while it is carried on the garage records by the registration number as well as the name of the owner. Each vehicle receiving attention is given an envelope which carries a serial number, and into this envelope is placed every charge that is made against the machine for the month, this including the labor expended as well as the material required.



T. & G. 10M-8-25-'12

NO. .....

BATTERY DEPARTMENT
THE H. E. L. CO.

DATE

MATERIAL--TIME

Name .....

Time and Material Record of Repair Shop of the Hartford Electric Light Company, Filled in by Workman, Printed on White Paper, Five Inches Length and Three Inches Width.

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C. P. L. H. 5M 11-27-11

EXTENSIONS CORRECT

ENTERED MAIN JOURNAL FOLIO

TERMS

BATTERY DEPARTMENT

Date

Received from

Location

Delivered by Via

BINDER FOLIO 16355

DATE BILLED

LEDGER FOLIO

STOCK CLERK	QUANTITY	MATERIAL	PRICE	AMOUNT	TOTAL DR.	TOTAL CR.
		WORK ORDERED				
		DELIVERED				

Original Billing Record of Hartford Electric Light Company, on Which Items Are Charged Daily, Printed on White Paper Seven Inches Length and 12 Inches Width, Perforated for Loose Leaf Binding.

Under ordinary conditions there might be no charge, other than the record of the current used, which is obtained daily from the charging sheet, and at the end of the month the customer's envelope is filed in the serial order, where it may be referred to quickly at any time. In the event of material being needed and time required for a repair, this is first brought to the attention of the garage by the daily report of the driver. This report is made in duplicate and after specifying the date, the name and make of the machine, each assembly in which trouble might develop is named, followed by a blank in which a check mark or cross is made. The sheet is then signed by the driver. The original report goes to the owner, and this is a check on any fault developed. The copy of the report, made in carbon, is delivered to the foreman of the garage. On the reverse of this copy is the "Repairman's Report," and this must be filled in by the foreman, specifying what disposition was made with reference to the fault reported, whether or not it was repaired, or why no repair was made if the machine is not ready for service. As it is the purpose of the garage to keep the wagons in condition for use it is only an unusual fault that cannot be given immediate attention. This report indicates the work performed on the machine, and if material is required

LABOR				COST				DESCRIPTION
DATE	HOURS	RATE	JOB NO	QUANTITY	MATERIAL	PRICE	AMOUNT	
								BATTERY TEST

Reverse of Original Billing Record, Showing the Items of Labor and Material, with Description for Future Comparison and Result of Battery Testing.

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it is noted and requisitioned by the foreman.

On the time and material card, which is given a serial number, is stated the material requisitioned, and the labor required for the work, and as each employee must account for each minute of time to be paid for his work, each card is returned to the foreman, signed by the workman, with the completion of the job, and not until one work is completed can another be undertaken without the permission and approval of the foreman. If the work is on a battery a card is filled in with the name of the owner and the number of the wagon. This card is divided into three sections with perforations for separation. One section is attached to the battery, another is posted on a board to account for the battery itself, and the third goes to the customer's envelope. With record of the time and material the prices are entered in the office, and with the batry card the charges are posted to a loose leaf record.

The charging record of the company is made on large sheets and each is ruled in columns for the charging lines, and cross-ruled for 39 entries with reference to time, so that each period may be accounted for during the 24 hours of the day. The record is very closely kept and the readings are made by hour or half-hour periods. In the charging the machines are identified by the registration numbers.

The system of the company has been developed with long experience and works out to the entire satisfaction of the officials. It may be possible that there will be supplementary record made with the opening of the new garage, but this is not as yet believed to be necessary.

The Hecker-Jones-Jewell Milling Company, New York City, recently took delivery of its third Sampson truck, made by the Alden Sampson Manufacturing

CHARGE 700 lbs. G. V. at 13 Amp. up to about 112 Volts
" 1000 " " " 16 " " " " 112 "
" 2000 " " " 20 " " " " 112 "
" 2 Ton " " " 26 " " " " 112 "
" Small 20 Cell " " 20 " " " " 52 "
" 40 Cell " 9 P. V. " 16 " " " " 104 "
" Edison 40 A 6 " 45 " to Sangamo Cut Out

Hartford Electric Light Company,

Vehicle Charging Record.

Date

	LINE No. 1 Car No.		LINE No. 2 Car No. 10841		LINE No. 3 Car No. 10547		LINE No. 4 Car No. 5447		LINE No. 5 Car No. 5446		LINE No. 6 Car No. 2047		LINE No. 7 Car No. 9303		LINE No. 8 Car No. 5450		LINE No. 9 Car No. 9748		LINE No. 10 Car No. 9754		LINE No. 11 Car No. 12679		LINE No. 12 Car No. 14348	
TIME	VOLTS	AMP.	VOLTS	AMP	VOLTS	AMP.	VOLTS	AMP.	VOLTS	AMP.	VOLTS	AMP.	VOLTS	AMP.	VOLTS	AMP.	VOLTS	AMP.	VOLTS	AMP.	VOLTS	AMP.	VOLTS	AMP.
8 A.M.																								
8.30																								
10																								
11																								
12 NOON																								
1 P.M.																								
7.30																								
Volts & Amp.																								
Watt Meter Reading																								
Odometer																								
Sp. gr. Final																								
Miles																								
W. H. Chg.																								
W. H. per M.																								

Section of Vehicle Charging Record of the Hartford Electric Light Company, Having Space in Width for 18 Lines and Remarks, and Length for 39 Entries by Time Periods, Each Line Being a Record for One or More Vehicles, with Essential Details—Printed on White Paper 22.5 Inches Width and 15.5 Inches Length.

This record identifies the job, states when the work was received and when it was promised for delivery, and the items of material and labor are entered on the reverse of this record sheet, together with a description of the work and whatever data are desirable, and a statement relative to the test or tests made with the battery. These records are kept in two binders, that of the unfinished work being known as the "live book," and the other of finished work being known as the "dead book." As the records are indexed, reference to them can be made instantly. When the work has been completed the requisitions are checked back and this insures against error and makes certain the correctness of the charges. Copies of the record sheets are made and sent to the office of the company, where the cost and the selling price are extended and entered in the bills rendered to the customers.

Company, Detroit, this being the second repeat order in less than a year. Novel methods of emphasizing the success and economy in the use of motor trucks were adopted by the purchaser when 12 horses and six men, supplanted by the new vehicle, were paraded behind it through the business section.

A 22-passenger KisselKar, made by the Kissel Motor Car Company, Hartford, Wis., was recently purchased for use between the Northwestern Railroad station at Highland Park, Ill., and the Exmoor Country Club. Round trips are made every hour. The roads are smooth, but very hilly, although the car takes all the hills on high speed. The vehicle is doing such good service that it is the object of much favorable comment in that section of the country.

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ELECTRIC VEHICLES IN COAL HAULAGE.

COAL is one of the necessities of life and the consumption is increasing annually. It is indispensable and there is no satisfactory substitute. It must be supplied in varying quantities and when required. The demand is somewhat governed by circumstances and conditions, but the distribution is dependent upon needs of the consumers. That is, each distributor endeavors to provide for his regular customers and to do whatever additional business he can, and the volume of sales depends upon his ability to make delivery for the prices that have been fixed by common consent.

To illustrate, there is a yard price for different grades of coal, and it is customary to charge a small sum additional for each ton when delivered within certain specified zones, usually one, two, three, four or five miles, and to make special rates for deliveries to longer distances. The prices ordinarily apply when the coal is delivered at manholes, chutes or bins on the ground floor or basement, and if the order is carried up one or more flights of stairs there are charges made for this service proportionate to the labor.



Cousens Coal Company's Couple-Gear Four-Wheel Drive Truck Hauling a Load of Five Tons from the Pockets.

Now it will be apparent that these prices are nothing more than approximations and do not by any means represent the actual cost of delivery. The same charge is made for hauling a ton of coal 300 yards as for a mile, and for hauling a corresponding excess of a single mile as for two miles, and so on. It is also clear that at least a half of the mileage is unproductive, and because of varying conditions not all the loads are to capacity, so it would seem that about 40 per cent. of the total is all that can be regarded as being pay mileage, that is, if the capacities of the vehicles are considered as the basis.

The variance in the length of the hauls brings about this condition. A charge of 25 cents a ton delivery for a quarter mile would be profitable, but to carry each ton a mile for that price would probably yield but little, if any, profit, for the load would be carried the full distance and the empty vehicle returned, making practically four times the haulage for the same charge as for the short haul. But as the service is based on average and not on actual cost, as each dealer is brought into competition with others who may be able through location to make a lower price for delivery and as the cost of haulage is constantly increasing, business reasons impel the maintenance of the rates for hauling, which is only possible through economy.

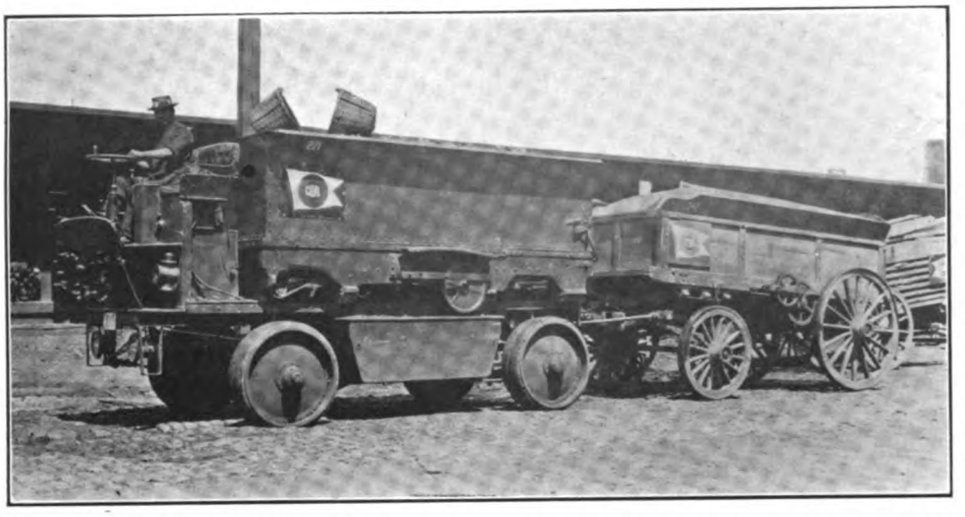
Coal haulage economy has been given careful attention for a comparatively brief period. For years horse vehicles were used without a thought as to the expense, as these were the only forms of transports available. While it is probable large enterprises found it cheaper to own and operate their own delivery equipment, it is also a fact that service is variable and what would be adequate at different periods of the year would be decidedly inadequate at others, in which event horses, carts and drivers were hired to meet any requirement. Some concerns having large delivery equipment found it profitable to allow other firms to use them during the season when the business was dull and in return received the use of the horses not required by the borrowing firm when there was a corresponding season of inactivity. But the fact remained, and this condition has been little changed, that delivery expense was not accounted and was regarded as an operating cost of practically unknown proportions.

Economy has always been a result of investigation that disclosed waste of time and money. The larger the business the greater has been the attention given to detail and record, and with the coal companies that were required to haul thousands of tons annually the possibilities were understood when motor vehicle transportation was promoted. It was not until within three or four years that experiments were begun with mechanical transports in coal delivery, and while there were probably isolated instances antedating these, as a matter of fact economy could not be determined because of the lack of reliable data.

It is probably not known that the largest number

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of electric vehicle used in coal haulage are in daily service in Boston, the first being utilized rather more than two years, and these have been found to be so satisfactory that the firms owning them have added constantly to their equipments. There are now no less than nine concerns having a total of 16 electric machines, and eight others are now being built for them, which will make a total of 24 when these have been placed in service.

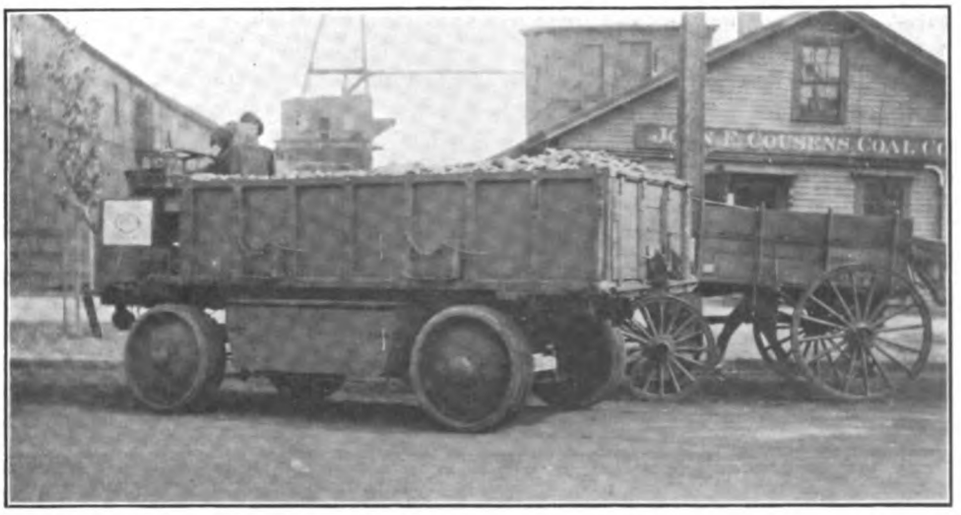


Cousens Coal Company's Four-Wheel Drive Truck Hauling a Wagon with a Three-Ton Load as a Trailer.

The equipment in use is of three makes, one being the Couple-Gear Freight-Wheel Company's four-wheel driven trucks, the second the Eldridge front-drive carts, and the third the General Vehicle Company's trucks. The service in each case is variable. With some the service is confined to what may be regarded as short hauls, being the cartage of capacity loads to buildings and plants where considerable quantities of coal are consumed daily. In other instances the transportation is longer distances with capacity loads, and there are the occasional trips and the family trade, where deliveries are made of supplies for considerable periods. There are also several firms that employ the machines to haul coal and ashes, the requirements of their plants being such as to justify this class of cartage because of the economy realized.

The first machine to be placed in service was installed by the J. N. Cousens Coal Company at Brookline, a concern that has a large business and whose customers frequently require considerable quantities, these including residences, apartment houses and manufacturing concerns. Prior to July, 1910, all of the work was performed by horses, and the service did not differ materially from that of any other firm doing a like business. The first vehicle installed was a four-wheel driven Couple-Gear truck, as it was believed the character of haulage was such as would require abundant power, and the thought was to utilize trailers when possible, this increasing the capacity of the outfit to 10 tons. When first delivered it was necessary to use an improvised body for a short time, but later it was equipped with a dumping installation. Brookline and Newton, where most of the business is done, are largely residential sections, and some of the streets and roadways used are exceedingly hilly. The purpose was to use the machine for long hauls so far as possible and to make short hauls when not otherwise employed, utilizing it to the best advantage.

The company wanted to get the largest service possible out of the machine and wherever possible a trailer, which was an ordinary wagon or cart, was hitched to it and the combined load hauled and delivered at practically the same speed as without the trailer. The cost was but little more than when the truck was used independently, and the saving was decidedly large as contrasted with any other form of delivery. The truck was worked through the first winter with decided satisfaction and in March, 1911, the Metropolitan Coal Company of Boston, one of the largest, if not the largest, coal companies in New England, after observation of the Cousens truck, made order for a truck of exactly the same specifications, this to be used for the delivery of coal in Boston and vicinity, but chiefly in long hauls.

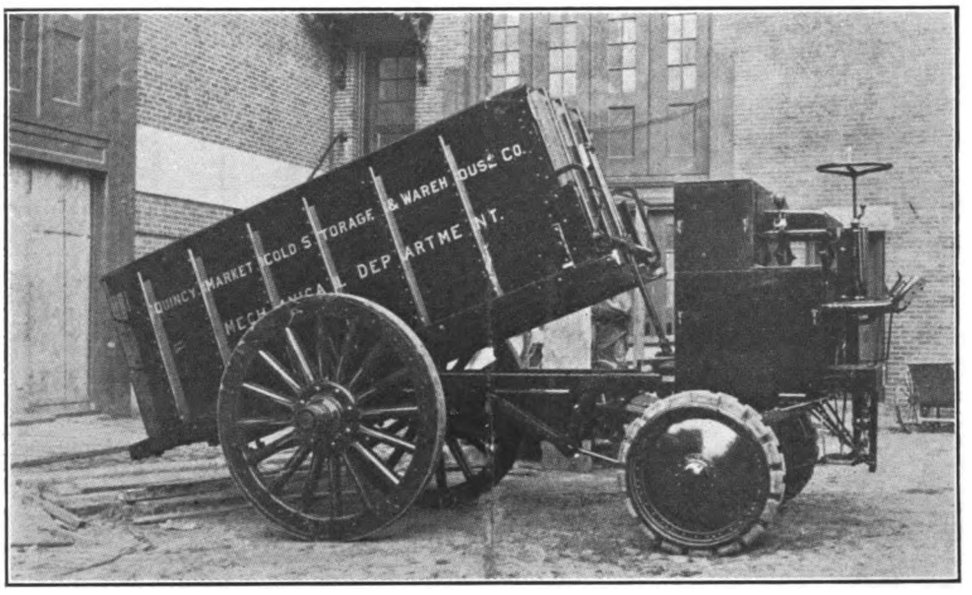


Four-Wheel Drive Truck and a Wagon Used as a Trailer in Making Delivery of Excess Capacity Loads.

In June, 1911, the second truck was delivered to the Cousens Coal Company, and this was practically the same as the first and it was intended that it should be

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used in the regular haulage with trailers wherever this was possible. The year of experience with the first machine demonstrated that the trucks could be worked constantly if desired, and that it was merely a matter of utilizing them. Then the company leased an abandoned roundhouse near the Cottage Farms bridge, Commonwealth avenue, from the Boston & Albany Railroad Company and used it as a garage. In this was installed a 5-50 ampere mercury arc rectifier, and the batteries were charged from an alternating current. Two batteries were provided for each machine and these were changed at noon each day. This necessitated charging day and night, and with this equipment the trucks were insured practically double the daily mileage if necessary. As a rule the machines were driven about 35 miles daily, hauling from 20 to 25 tons on long hauls and from 30 to 40 tons on short hauls, where the coal is delivered without unusual delay. For large orders trailers are used, and then the capacity is materially increased. It should be stated that pending the regular installation in the roundhouse the batteries are being charged with a motor generator. The success with this truck was such that another was ordered and was delivered in August of this year, and two more have been ordered for delivery as early as possible.



Five-Ton Eldridge Front-Wheel Drive Tip Cart, the First Machine of the Kind in the World to Be Equipped with Electric Hoisting Body.

With each truck an additional battery has been ordered and this will give the company practically the same as 10 trucks when each battery is utilized to its capacity, to say nothing of the additional haulage with trailers. Practically all the extra equipment provided has been a spare wheel, which may be used on any of the trucks if necessary. All of the work about the garage is done by one man, who also cares for two automobiles that are used by the officials of the company. The attention is confined to lubrication and adjustments and from time to time it will be necessary to replace worn parts. So far as the batteries are concerned they are simply given whatever distilled water is needed to restore that lost through evaporation, and there is a contract with the agent for the truck that when the batteries fall below 90 per cent. efficiency the battery plates are renewed. Up to now the trucks have each given practically the same service that could be expected from three double horse teams, and it is estimated that the cost of operation is $12.84 a day.

This expense is itemized as follows: Operator, $2.50; current, $1.60; tires, $2.35; batteries, $2.67; new parts and repairs, 50 cents; depreciation at 10 per cent., $1.33; fire insurance, 40 cents; liability insurance, 32 cents; floor space at $50 a year, 17 cents; supervision, 50 cents; interest at 5 per cent., 50 cents. At a mileage of 40 daily and with five-ton loads this gives 100 ton-miles, the cost being 12.8 cents a ton-mile.

The Metropolitan Coal Company used its first truck until January, 1912, when it ordered its second machine, this being an Eldridge cart. This is an entirely different vehicle, it being an equipment where the forward or motor section is carried on the front wheels, and about 90 per cent. of the load is carried on the rear wheels, which are equipped with steel tires.

The front wheels are the Couple-Gear patent and are driven by motors within them, the battery being carried under the driver's seat. The forward part of the running gear is attached to the front wheels and the body is of a dumping type, having a capacity of five tons. These machines have been termed "Philadelphia dump carts," and when a platform or truck body replaces the dumping body it is known as a "Boston caravan." Having but half the motor power of the four-wheel drive trucks these are somewhat slower as to speed, but have the same carrying capacity. This cart was an experiment and was worked with the animal service, doing what may have been regarded as the shorter of the long hauls, also practically any work that was required in delivery.

The work performed by this cart was exceedingly satisfactory, and while each machine is built to order and time is required for delivery, a third cart was delivered in May of this year, a fourth in July, a fifth in September and two more are to be placed in service as quickly as they can be produced. When these orders have been filled the company will have a four-wheel drive Couple-Gear truck and six Eldridge carts in its service. Until recently these machines were kept at the Atlantic Avenue garage and were maintained by the service at that station, but the company has constructed a garage on one of its coal piers at the foot of Summer street, where it will in future keep its machines. The building is of wood, a single story, with

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a series of wide doors in the front, so that each vehicle may be backed into its bay and may be driven out without utilizing any of the floor space, all the turning



One of the Fleet of Eldridge Front-Wheel Drives, Capacity Five Tons, in the Service of the Metropolitan Coal Company, Boston, Mass.

being done outside the building. The structure is well built, has a fine concrete floor, and it is constructed with a view of expansion.

In the service of the company these vehicles have given a maximum speed of six miles an hour and a daily mileage of from 25 to 30, according to the work, hauling five tons, but where the streets and roads are rough and hilly it is probable that this would be reduced somewhat, for the purpose of the cart is primarily economy. It is safe to place the average mileage at 25, and this gives about 62.5 ton-miles. The cost of operating carts of this character has been placed as follows, this being what is believed to be a fair approximation: At owner's plant—Driver, $2.50; current at two cents a kilowatt-hour, 76 cents; tires, one set a year, 90 cents; batteries, one renewal a year, $1.17; new parts and repairs, 33 cents; depreciation, 10 per cent. less batteries and tires, 94 cents; fire insurance, 25 cents; liability insurance, 32 cents; interest at 5 per cent. on averaged investment, 32 cents; floor space, $50 a year, 17 cents; supervision, 50 cents; total, $8.16. At the garage the cost is placed somewhat in excess of these figures, the estimate being as follows: Driver, $2.50; current, $2.80; with the other items the same, without a charge for floor space or supervision, the total being $9.53.

It will be understood that these estimates are made from the results actually obtained in daily service in Boston and vicinity, and are conservative. With the cost as given at the garage of the owner the cost per ton-mile is placed at 13 cents, and at the public service station 15.2 cents. With relation to the carts they have been worked constantly since delivery, some of them through the severest winter weather, there being comparatively little reduction in average service because of the highway conditions. The Metropolitan Coal Company has equipped its garage with a 50 horsepower 30 kilowatt generator and the intention is to give long, slow charges. The company has provided a stock of the parts that may be expected to wear and it has a spare wheel for emergencies, and all of the attention to the machines is to be given by the mechanic who is on duty nights. It is stated that this is the only electric garage maintained by a coal dealer.

One of the most interesting installations is that of the Quincy Market Cold Storage and Warehouse Company, which is believed to be the largest cold storage plant in the world. The company has two plants, 2000 feet apart, the one being at the water front and the other in the business section of the city. The company receives its coal at the pier and it is necessary to haul the supply needed for the inland station. This was formerly done by horses. In giving the order for this cart it was specified that the body should be automatically hoisted and lowered, and it was built with an electric hoist which is said to be in every way efficient. This was the first electrically hoisted tip cart ever built, and so far as known it has not been duplicated. Thirty tons of coal are required each day at the inland plant, and each morning the cart is engaged in hauling this quantity from the pier, and in the afternoon ashes are hauled from the warehouse, whatever spare time the driver has being devoted to general haulage. The company makes its own current and charges the battery, having one charging panel for equipment, and in the 11 months it has been in use nothing has been spent aside from the wages of the driver but for current and $20 for spare parts that it was believed desirable to have on hand. Since it was placed in service the company has never required the use of animal vehicles for the work it was bought to do.

In December, 1911, the Edison Electric Illuminating Company of Boston took delivery of a five-ton cart which was placed in service hauling ashes from the L street station of the company to a dump, the work required of it being to handle a cubic yard of ashes an hour. The cart has been in use daily since that time with excellent satisfaction, and has been unusually economical, for it is kept at the Stanhope street garage of the company, where it is charged and maintained to the standard of efficiency for which the company's equipment is noted.

In June of this year the Locke Coal Company, Mal-

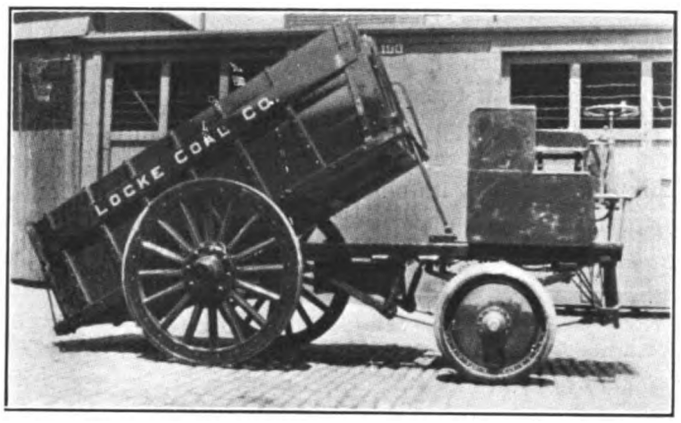


New Electric Cart Garage of the Metropolitan Coal Company at Its Wharf Pockets.

den, Mass., was delivered a five-ton cart which was placed in the delivery service of the concern. This machine was garaged on the premises of the company

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and the current is supplied at present through a mercury arc rectifier with current taken from the lines of the Malden Electric Light Company. Shortly after



One of the Carts with Eldridge Front-Wheel Drive Operated by the Locke Coal Company, Boston, Mass.

the cart was set at work a second machine was ordered, and an order was given for a three-ton Wright hoisting body, which will be used in the haulage of lime, cement and building material. The company has built a garage on land next to its wharf, where the machines will be kept, and the attention will be by the mechanic on duty at night. The cart now in use and its driver are doing the work of two two-horse teams. The average work is practically the same as has been realized by the Metropolitan Coal Company.

The Staples Coal Company received its first five-ton cart in July of this year and this was garaged at the Atlantic Avenue garage, where it is now given attention, but the plan of the company is to eventually garage its own vehicles and to give them the same character of attention that is provided by the other firms that have been mentioned. This concern has ordered two more of the carts and these are to be delivered as quickly as they can be produced.

The Hunt-Spiller Manufacturing Corporation, located in Dorchester avenue, South Boston, maker of heavy castings, has one four-wheel drive truck with a dumping body, which it utilizes with two batteries, this giving it practically double the mileage. The cart is used for hauling coal, coke and molding sand to the foundry and for removing ashes and slag, as well as hauling pig iron and castings. This cartage is heavy and the loads are variable, but the truck has given the best of service since it was installed in February, 1911. The machine is giving about the same mileage and at the same expense as are the trucks of the Cousens and the Metropolitan companies, and it has been worked constantly. The company makes its own current with a crude oil engine that is also used for other purposes, and a generator, and it will continue this when the five-ton cart that has been ordered has been delivered. This cart will be used for much the same form of haulage as the machine now in use, but the speed will be somewhat less.

Three other firms have ordered carts of five-ton capacity, one of these being the Wellington-Wild Coal Company of Cambridge, Mass., but this particular order will utilize the body and running gear of a cart used with three horses. This outfit will be fitted with a Keystone hoist and it will be utilized for the delivery of coal. The business zone of the company is within a radius of perhaps five miles, and the cart will have a capacity of 30 miles a day with five-ton loads and on reasonably good highways. This company will buy its own current and use a charging panel in its garage. The other two orders are to go to Providence, R. I., the one to the Seaconnet Coal Company, and will be used for the short haul deliveries for which animal carts are now employed. The company has a garage at its pockets in Allen avenue and it will use current supplied by the Narragansett Electric Lighting Company. The second Providence order is for the Brown & Sharpe Manufacturing Company, and this cart will be used for hauling coal to the mammoth plant from the coal pockets of the Eastern and Seaconnet coal companies, about a mile and a quarter distant, and for removing ashes from the works. The cart will have a dumping body equipped with a chain hoist. Two batteries will be provided and the company will utilize current produced at its own power plant.

D. J. Cutter & Company, coal dealer, in Freeport street, Dorchester, has in its service two five-ton General Vehicle trucks equipped with dumping bodies that are used in general coal haulage, making from 30 to 35 miles daily. The first truck was placed in service Dec. 15, 1911, and the second Aug. 14, 1912. The trucks are loaded from hoppers or chutes by gravity at the coal pockets and capacity loads are usually hauled, but it is necessary to make deliveries by the usual means, either by dumping or by chutes, this requiring longer time than for loading. Both of these machines have given excellent satisfaction, the work of the first earning the order for the second. While the company has kept some data as to service it has practically nothing as yet as to maintenance, because there has thus far been no occasion for any other work than the usual attention. The second truck was acquired so recently that no maintenance statement can



Eldridge Front-Wheel Drive Five-Ton Cart Utilized by the Edison Electric Illuminating Company of Boston.

be made. The company places the dead mileage as half the total for the day, and estimates the ton-mileage to be from 75 to 87.5.

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PUBLIC SERVICE STATION METHODS.

The Admirable System of Accounting the Vogue in the Woods Electric Garage, Philadelphia, Penn., Developed by Experience to Meet All Requirements.

By William W. Scott.

THE application of system to a business means an accurate knowledge of every detail of revenue and expense, but to obtain these results it is necessary to have record of all works performed. It may be assumed by those who have limited knowledge that systematization is expensive, because to keep the records specific duties are required of different persons, and it may be believed that clerical work necessarily occupies time that may be profitably devoted to other work. It will not be maintained that record making can be left indiscriminately to different individuals, but it is absolutely certain that where systems are employed the causes for waste may be learned and means taken to secure economy.

The electric garage is the exception and not the rule. Usually such stations are limited in volume of business transacted, and those that do exist are not sufficiently well systematized to regard them as examples for those who may contemplate engaging in such enterprises. Under ordinary circumstances the number of electric pleasure vehicles in service are comparatively few when contrasted with other types of automobiles. There are some garages that give service to such machines, but this is incidental to the general business done.



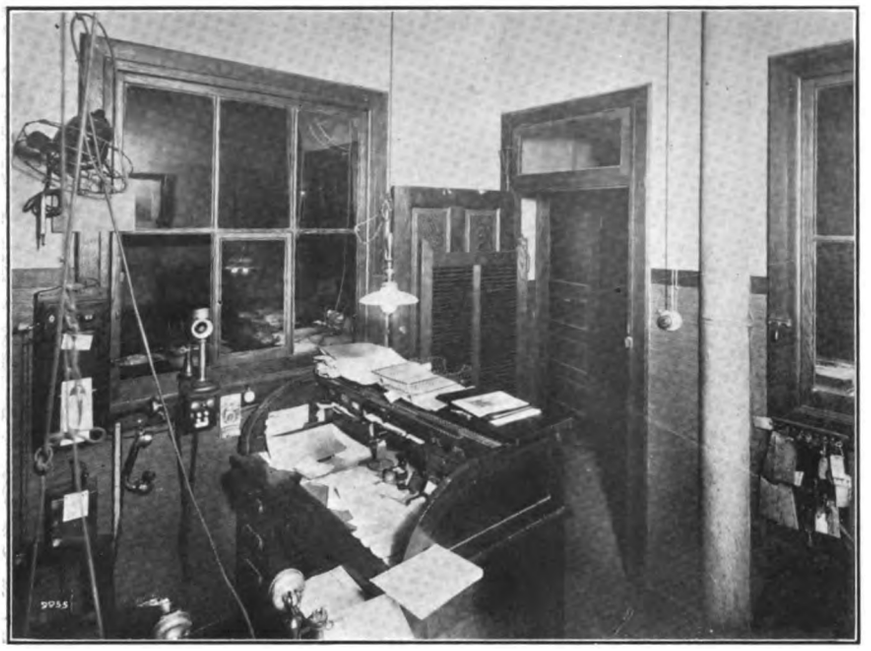
Woods Electric Garage, 21st and Market Streets, Philadelphia, the Offices at the Right of the Entrance and the Salesrooms at the Left.

Some of the large concerns that utilize electric wagons and trucks for haulage maintain their own garages, and these are conducted by differing systems, but such methods are not always applicable to general service. The business is often a routine that can be depended upon as to volume and its demands provided for, but there must be an elasticity in public service that will be sufficient to meet with all reasonable requirements.

One of the best examples of the public electric service station is that of The Woods Electric Garage, 21st and Market streets, Philadelphia, Penn., which is the development of the business established by J. C. Bartlett Jan. 15, 1909, at 1808-10 Chancellor street, the establishment having then a station with an area of 1800 square feet. A building 70 by 200 feet, with three stories in front, was erected and was opened for business Sept. 1, 1909. This is the structure now occupied by the station today. When this station was opened for business it had three applications for service from owners of electric cars, and gasoline machines were taken with the understanding that the service for such vehicles was to be given only so long as they could be accommodated and there was room for the electrics.

The demand for garage accommodation and salesrooms became such that the building was not sufficient to meet them and the Bartlett Garages, Inc., purchased the business from Mr. Bartlett and assumed control July 18, 1910. Additional property was acquired and on this another building was erected, four stories on Market and 21st streets, with a garage of the same proportions as the first, making the whole property 180 by 220 feet, given over to automobile salesrooms and storage and maintenance. The buildings are of brick and iron with stone trimming. The total floor space is 92,400 square feet. The floors of the two garages are approximately 70 by 172 feet each without a post, a bridge construction supporting the roof.

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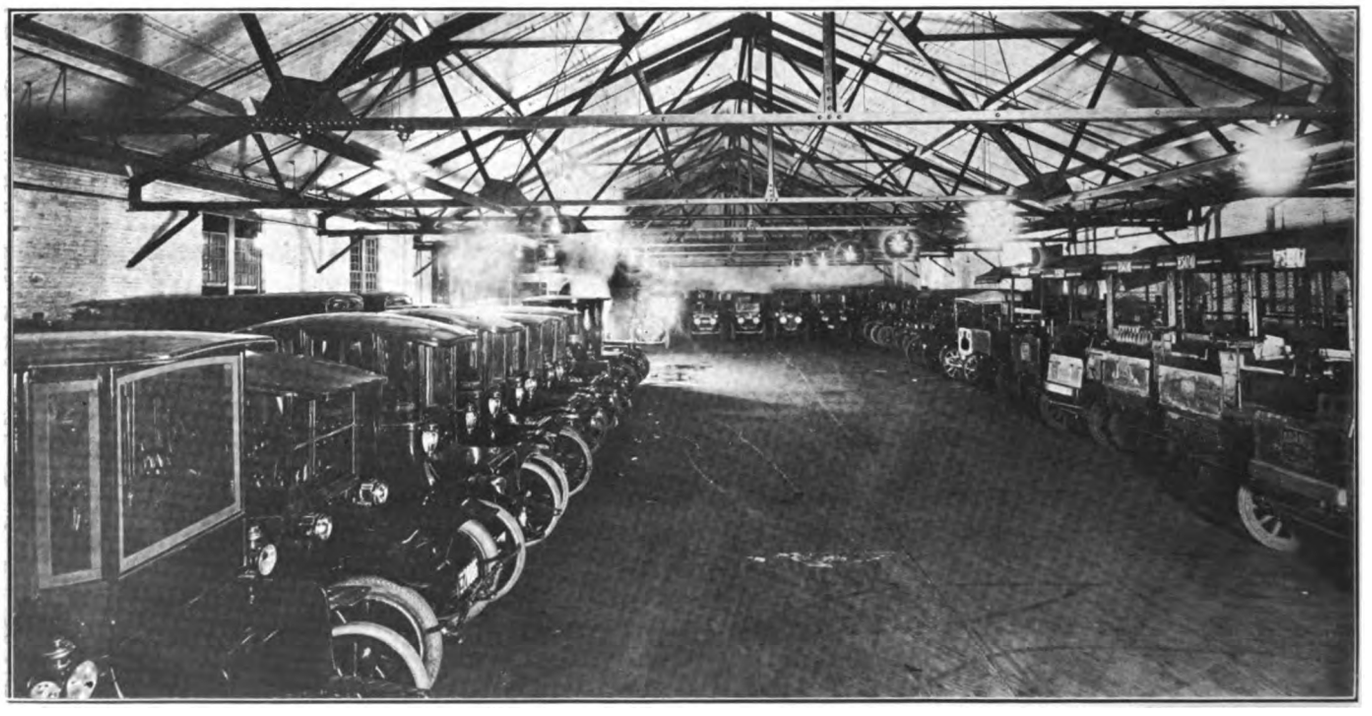


Office of the General Superintendent of the Woods Electric Garage and the Private Office Next Beyond.

The Woods Electric Garage occupies the first floor of the building first erected, there being a large entrance in the centre into the garage. At the right is a showroom, back of this a general office and the manager's office, a supply room and a stock room. At the other side is a large showroom, a ladies' room and a large elevator. There is no basement under the garage section of this structure. The other section of the building devoted to a garage parallels the original structure, and under this is a basement, and in this basement is located the repair shop and the battery room of the electric garage, access being by stairs and a car elevator at the street. The basement is large and there is a passage so that cars may be taken to the repair shop as conveniently as though on the street floor.

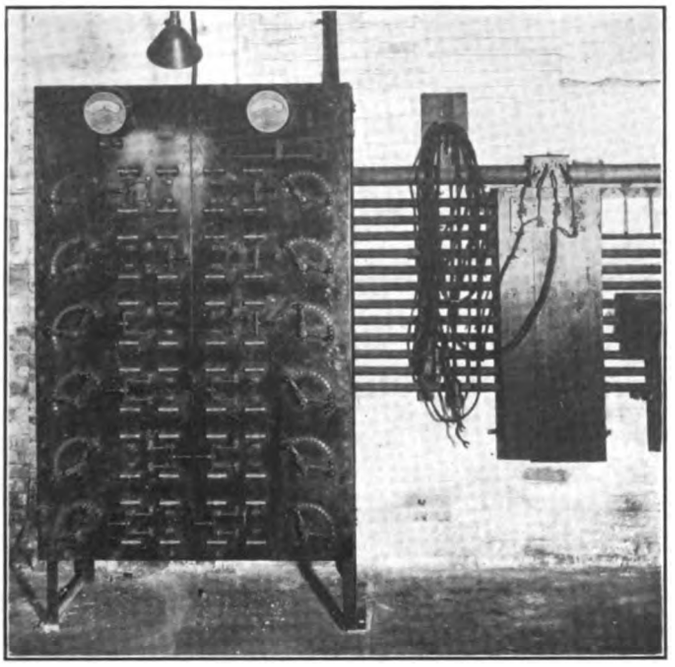
The repair shop is well equipped with machine tools and facilities for repairing, and it is possible to do whatever work may be required, the workmen being thoroughly experienced with electric vehicles of all descriptions. Parts of the different machines for which the garage is agent are carried and are always available if needed. Any kind of work can be done as desired and with the equipment in the shop it is possible to meet any reasonable requirement within a limit of time. The battery room is unusually large and well equipped, with every facility for the proper care of all types of storage batteries. A corps of expert battery men are on duty night and day, insuring the highest class of service to the customers.

The garage floor given over to vehicle storage will accommodate approximately 150 machines of average proportions, and this number is now receiving care, of which about 80 are electrics. The policy of the garage is to take all electric cars, wagons or trucks that may make application, and to provide for whatever gasoline machines can be taken without encroaching upon the service for the electrics, but if necessary a gasoline car will be refused a continuance of garage attention to make room for an electric. In other words, electric machines are given the preference. The electric vehicles garaged are about equally divided just now, but it is probable that the number will be in-



Floor of the Woods Electric Garage at Night, Showing the Machines at Either Side—The Capacity of This Station Is 150 Vehicles.

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Self-Contained Charging Panel, Woods Electric Garage, Showing Method of Bringing the Outlets to the Charging Leads.

creased to considerably more than 100 with the return of the owners from their summer homes in the country and at the seashore. Of the number now cared for about 15 are service vehicles, not including a battery of 28 two-ton electric wagons owned by the Adams Express Company on temporary storage until a charging plant is installed and ready for service in the garage of the express company.

The front section of the garage is given over to the electrics and the gasoline cars are stored at the rear. There being no obstruction in the floor it is possible to economize every inch of space, and the machines are lined in rows against the side walls so that they may be driven out without difficulty. Along the walls are the charging receptacles or leads, these being arranged that 36 batteries may be on charge at one time, this outfit being large enough to take care of about 100 pleasure cars on regular charge. The charging panels are arranged conveniently along both sides of the floor and are accessible to visitors at all times.

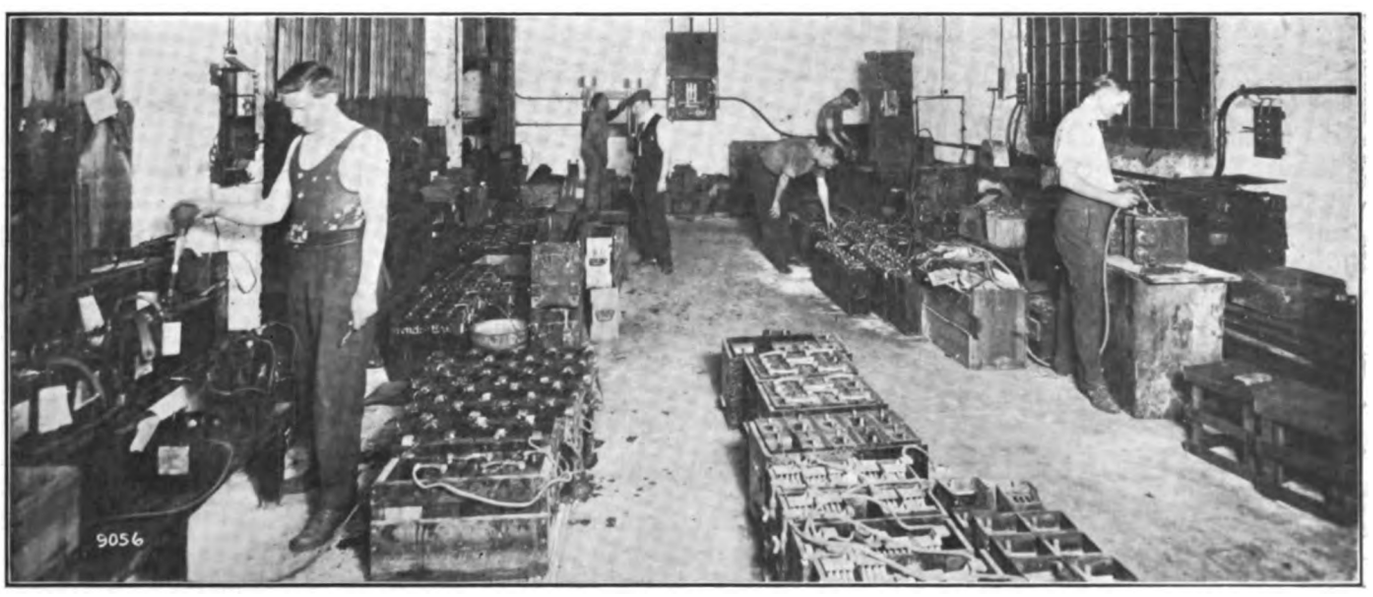
The garage, as agent for the sale of Woods electric pleasure cars and for Walker electric wagons and trucks, is required to maintain a sales department for the display and demonstration of these machines. The demands upon the department are variable, but as the business is conducted with reference to making sales this division is always active. It will be understood that the garage really consists of four divisions, storage and attention, repairing, sales of cars and sales of accessories and equipment.

In the presentation of the system of conduct of the garage it is not intended to take up in detail the two sales departments, but it is proposed to describe the methods of accounting for the garage and the repair department, for these have been developed with a great deal of care and have been found to be in every way satisfactory.

In fixing the service rates for pleasure vehicles it was determined to break away from the established custom of making a flat rate covering everything, and to make a separate charge for each service, owing to the difference in attention necessary with the various types and batteries.

A uniform price of $20 a month has been placed on the garaging of the cars, including washing and keeping the cars polished and cleaned inside and out. Current is supplied when necessary for recharging at the rate of five cents a kilowatt. Cars are delivered to the owner when so ordered, day or night, by neatly uniformed attendants. The charge for this service within half a mile limit is $5 a month, and beyond that distance car fare for the return of the driver is also charged.

When a car on regular storage is placed on charge during the day, no charge is made other than for the current used, but after 6 in the evening a charge of 50



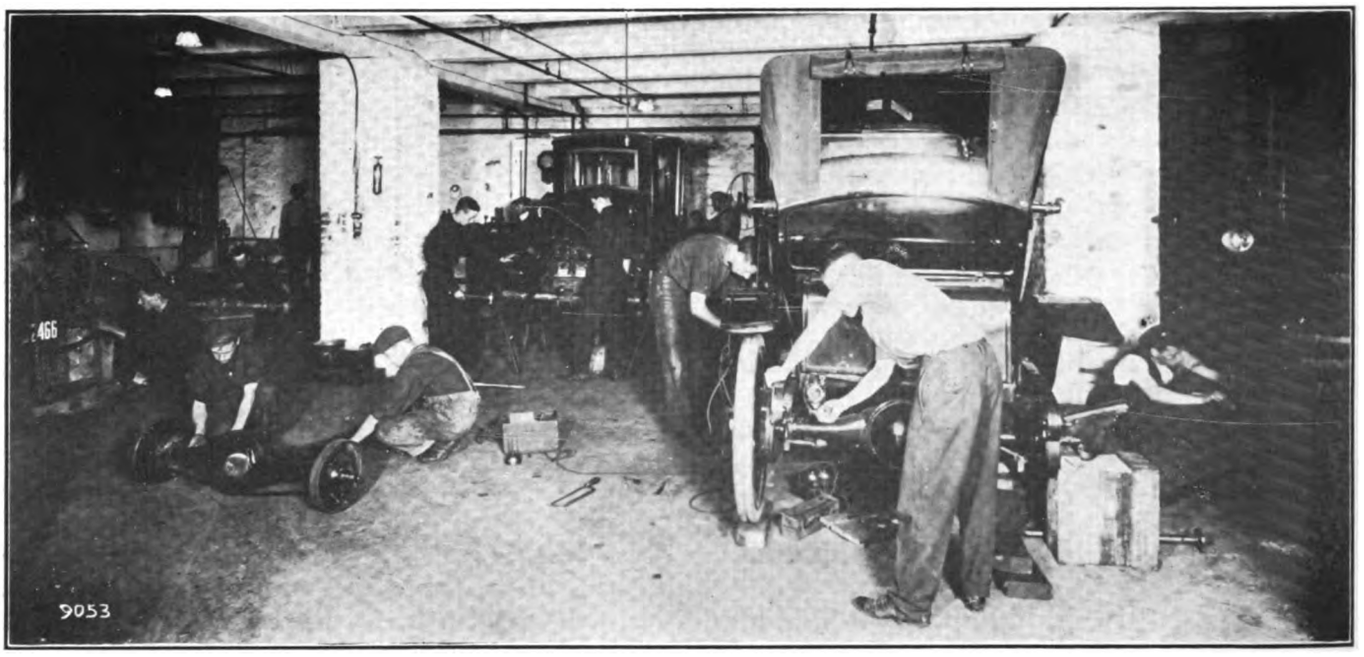
Battery Room of the Woods Electric Garage, This Department Being Fitted for All Manner of Service and Attention.

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cents is made for storage, in addition to the cost of current. This is to prevent the leaving of cars in the garage ostensibly for charging, but in reality to get garaging facilities without cost, and impeding also, by crowding, the work necessary on the machines given regular service.

The attention given pleasure cars consists, besides storing, of washing, polishing and cleaning, oiling and greasing, and the work that is performed on them in the way of inspection, adjustments, etc., is additional. Repairing is charged for at a regular charge for labor, plus the cost of stock or material used.

The rates for commercial vehicles are worked out somewhat differently, owing to the fact that they can be counted on for 12 months' storage, while the pleasure cars have only about nine months' service. The prices of the garage are worked out on that basis, the costs, ranging from $15 a month for a 500-pound wagon with panel body, to $30 a month for a five-ton with express body; large panel bodies on the larger size trucks are charged for in proportion.



Section of the Repair Shop of the Woods Electric Garage, Which Is Equipped with Every Facility for Building a Vehicle.

Current is supplied to trucks at the same rate as to pleasure cars, and this rate also includes, as with the pleasure cars, flushing with distilled water, cleaning and painting of the trays and battery compartments. Equalizing of the batteries in both cases is charged for at the rate of five cents a kilowatt, plus the necessary acid or water used in the rejuvenation.

For the purpose of accounting for each vehicle, whether regular or transient, with relation to the service given, what is known as a log sheet has been devised. This is a system for checking at the conclusion of each working day, morning and night, the cars that are in the garage at the time the foreman in charge leaves the building. The specimen sheet indicates fully what this requires, and aside from writing in the first three columns it is simply a matter of checking. Each sheet is ruled for 25 entries and for 12 columns, but one side being used. Above each column are the headings: Owner, Make, Type, In, Out, Washed, Cleaned, Charged, Account Shop, R, D and T. With reference to several entries across the page, the first gives the name of the owner of the car, the make of the car, the type of the body, and then check marks are filled in in the other columns, these indicating the following: If the car is in when the foreman goes off duty, if the car is out, if the car has been washed, if the car has been cleaned or polished, if the car is an electric that it has or has not been charged, if the car is in the garage to be repaired, whether it is regular storage, whether it is dead storage, or whether it is transient. This log sheet gives an account of every car that comes into the garage for any reason whatever, and used with the transient card it prevents mistakes in the bookkeeping and the under or overcharging in the billing, and there is no chance of a car remaining in the garage for any length of time without a charge being made for it. The log is the result of observation and experience of more than three years, and it is believed that the system will save enough in a single month to pay for the labor and printing for years. The sheets are made small for convenience in handling and any number necessary may be used. The sheets are numbered according to the period, two for each day, and each period sheet bears the period serial number. These sheets are filed in loose leaf binders.

The billing is by the hotel system, in which the items are charged each day and the bill as kept may be rendered at any time with a certain knowledge that it is correct up to the day of presentation. Each customer has an envelope assigned to him in a vertical file in which is kept every record pertaining to his bill, and after the billing has been completed for any given day any item may be instantly referred to. Each bill

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OWNER	MAKE	TYPE	IN	OUT	WASHED	CLEANED	CHARGED	a/c SHOP	R.	D.	T.

This Report made at 6 A. M / P. M. on .....Mo..... 191.....

Sheet No.....

FORM I

.....
Foreman

Form I, Reduced Specimen Sheet from the Log Book, Printed on White Paper for Loose Leaf Binding, 9.25 Inches Length and Seven Inches Width, in Which Entries Are Written in the First Three Columns and Check Marks Made in the Remaining Nine Columns.

is kept in a loose leaf binder and the form has a stub that is detached when the bill is submitted. Examination of the bill will explain the provision made for the daily items, and the summaries of the charges of every character. Comparison of the log sheets will indicate some of the items included in the bill. Before the bill is mailed the records contained in the customer's envelope are checked to verify each charge.

For each car or machine there is kept what is known as the "daily current charge" card, which is self-explanatory. This card indicates the name of the owner, the date, the time (day or night), the make and type of vehicle, the trip reading of the odometer, the total reading of the odometer, and whether day or night storage. Then follows the charging records, taken every hour during charge, these showing the hour and minute of beginning the charge, the voltage, the amperage, the ampere-hours, the temperature and the specific gravity of the battery, these entries being made in columns, there being 21 entries possible. In addition the record provides for other attention, under the head of remarks, these including the total ampere-hours, the total kilowatt-hours, the cost, whether or not water was supplied the cells, if the battery was equalized, if new jars were used, the number of hours of lead burning, the reading of the meter at start and finish, the factor and the total kilowatt-hours. Space is given for the entry of readings if a watt meter is used to check the readers on the card. The card is numbered and it also shows the number of the folio on which billing was made and by whom it was posted. This record goes to the customer's envelope. The final entries are made when the machine is taken off the circuit and the cards are sent to the office each morning to be entered. All battery work in addition to the regular charging is charged for at 75 cents an hour.

In the mechanical work there is a monthly job card on which is charged the grease and oil used each day and the attention given to the different vehicles that may be included under the regular monthly charge.

Whenever a defect is reported by owner or driver,

FORM III

MATERIAL

TOTAL

Expenses

Labor

Total Cost

LABOR

DATE	EMPLOYEE	HRS.	DATE	EMPLOYEE	HRS.	DATE	EMPLOYEE	HRS.

Date Date Promised REPAIR CARD NO.

Name

Address

Make of Car

Order Received by Work ordered by

Charge to

INSTRUCTIONS

Tested by

O. K. by Supt.

Form III, Shop Repair Card, Used for All Repair Work, Entered in Triplicate, the Original on White Paper, or "Cost" Sheet, Going to the Office; the First Copy on Yellow Paper, or "Selling Price" Sheet Going to the Foreman, and the Second Copy on Manila Card Being Attached to the Vehicle. Original and First Copy Printed on Both Sides, the Card on the Instruction Side Only. Size, 12 Inches Length and Six Inches Width.

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or is discovered in the examination of the machine, the vehicle passes from the monthly job card to what is known as the "shop repair card." This card is serial numbered, and issued in triplicate; the white sheet going to the office, and known as the "cost" sheet, the yellow sheet being kept by the foreman of the repair shop, and known as "selling price" sheet, and the manila card is fastened to the car. On these is entered the date of the order, date promised, name and address of owner, make of car, order received by whom, work ordered by whom, and to whom the bill is to be charged.

Then follows instructions, written by the superintendent of service, which show the work to be done on the car, as well as instructions to the mechanics, to whom the work has been assigned, and there is a final entry to be made when the machine has been tested, that indicates the tester, and shows that the work has been approved by the foreman.

On the reverse sides of the office and shop sheets are sections for specifying the material used and columns for the prices, a section showing the date and hours of labor and by whom the work was performed, as well as a summary of the total labor and the total cost to the customer for the work.

On the white sheet all of the material and labor is entered at cost in the office, the items being entered from the requisitions forwarded directly from the stock room. On the yellow, or shop sheet, the material and labor are all entered at the selling price, and after a job is finished is available to show the customer in case any dispute about the bill arises.

The expense is entered from the petty cash vouchers and the labor is entered from the time cards. The serial number of the job is shown on the bill and reference can be made to any particular job at any time through this notation.

The requisitions are all made out in the name of the customer, showing the stock or material required and each bears the serial number of the work order and the serial number of the requisition, and they are signed by those receiving the articles requisitioned and the clerk delivering the order, this giving a double check on the stock room. The labor is charged to the department in which it is performed, either the repair shop or the battery room. The labor account is kept in loose leaf form in a binder that is known as the labor book. In this are entered the names of the men, the total amount of the pay for each week, and the total amount of labor by hours, this being extended to its proper column to "Machine," "Battery," "Garage," "Watchman and Janitor" and "Office," each page being the account for six men for a week. The total for the page is obtained and to this is added the

FORM II

THE WOODS ELECTRIC GARAGE
OWNED AND OPERATED BY
THE BARTLETT GARAGES INC.
MAIN OFFICE
11-17 NORTH 21ST STREET
PHILADELPHIA, PA.

BELL AND KEYSTONE PHONES

EXPERT BATTERY REPAIRS
REPAIRS TO ALL ELECTRIC CARS
BODY BUILDING AND REPAIRING
TOPS AND WIND SHIELDS
ACCESSORIES OF ALL KINDS AT LOWEST RATES

Customer's cars are driven by our employees solely at owner's risk.

_____ 191

Mr. _____

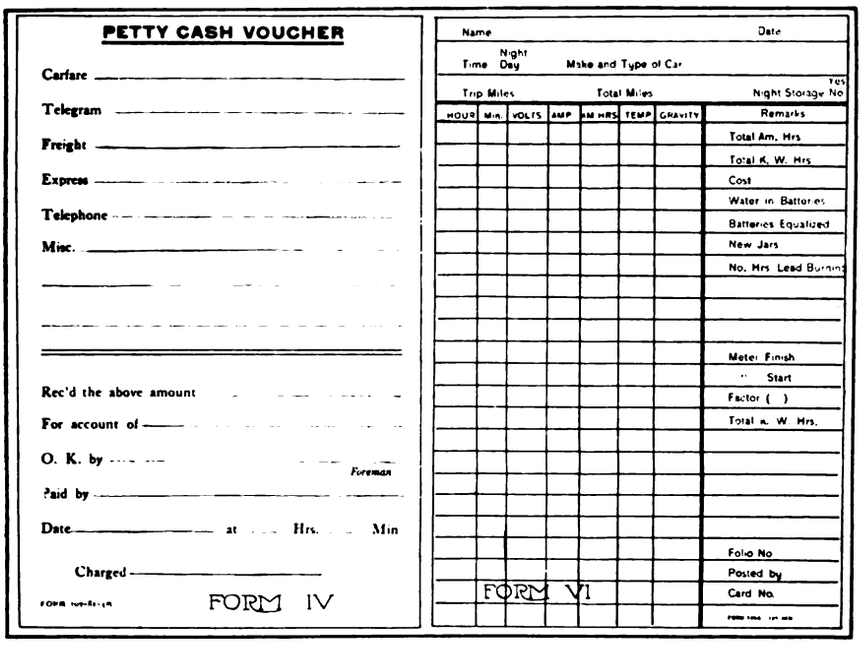
Address _____

DAYS	OIL PINTS	GASOLINE GALS.	WASH & POLISH	CURRENT	STORAGE	
1						Garage Service per month $
2						Garage Service per month $
3						Storage
4						Delivery Service
5						Car Fare
6						Wash and Polish
7						Gasoline gals. @ ¢
8						Oil pints @ ¢
9						Current
10						Repairs
11						
15						
16						
17						Supplies
18						
28						
29						
30						Total
31						
TOTAL						

Form 104 XXXX½M

Form II, Reduced Specimen of the Monthly Bill, Printed on White Paper 9.5 Inches Length and 12 Inches Width, with Stub Perforation 3.5 Inches from Left Side, the Stub Being Used for Notes of Service Concerning the Items Charged. The Bill Is Posted Daily and the Total Is Made up at the End of the Month.

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PETTY CASH VOUCHER

Carfare
Telegram
Freight
Express
Telephone
Misc.
Rec'd the above amount
For account of
O. K. by — Foreman
Paid by
Date — at — Hrs. — Min
Charged

FORM IV

Name — Date
Time Night Day — Make and Type of Car
Trip Miles — Total Miles — Night Storage Yes No

HOUR	Min.	VOLTS	AMP	AM HRS	TEMP	GRAVITY	Remarks
							Total Am. Hrs.
							Total K. W. Hrs.
							Cost
							Water in Batteries
							Batteries Equalized
							New Jars
							No. Hrs. Lead Burning
							Meter Finish
							Start
							Factor ( )
							Total A. W. Hrs.
							Folio No.
							Posted by
							Card No.

FORM VI

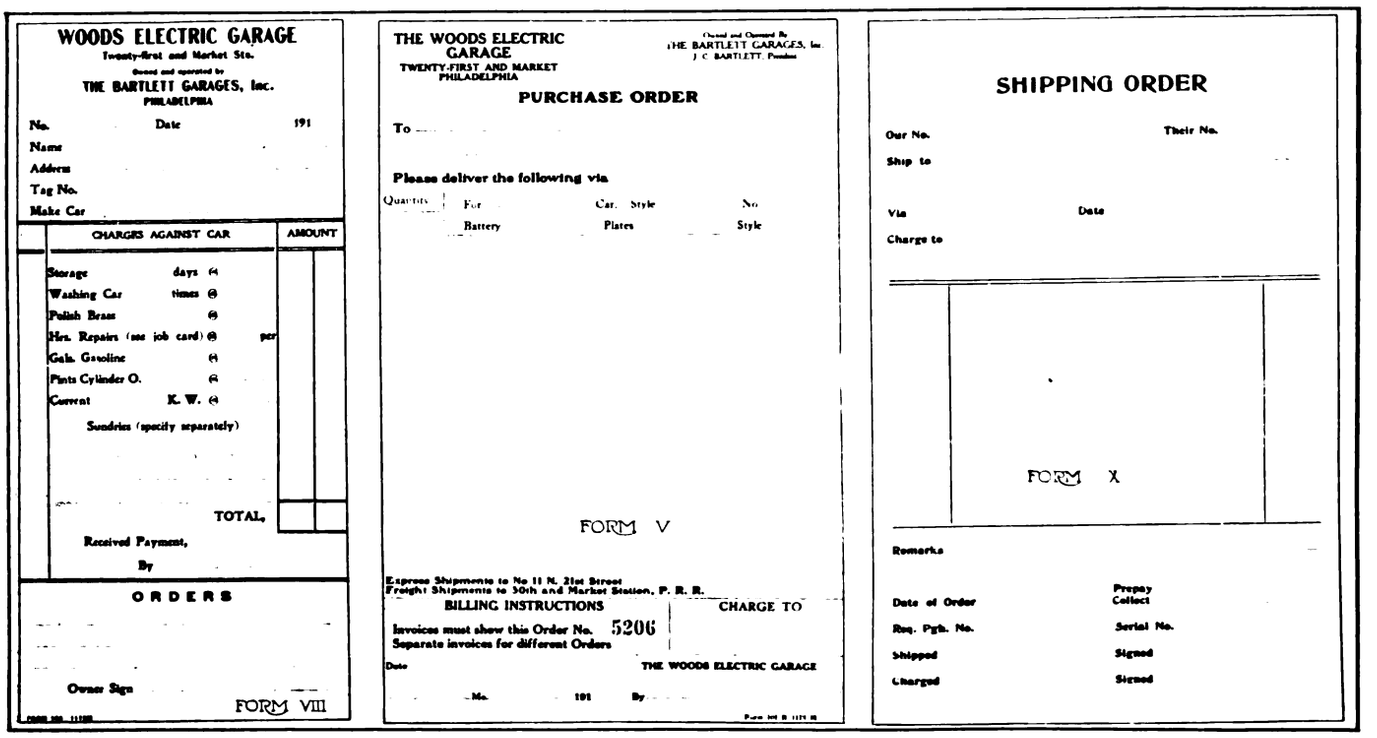
Form IV, Petty Cash Voucher, on White Paper, 6.25 Inches Length and Four Inches Width—Form VI, Charging Card, on Thin White Card, Six Inches Length and Four Inches Width, with Blue Horizontal and Red Vertical Ruling.

amount brought forward and then the total of the two is carried forward to the next page. It will be understood that this record can be applied to the day or to the week as desired, and it will show the cost of labor in each department, for the pages are numbered and the entries can be applied from any given date to another, and the total for each department can be ascertained at a glance for any length of time desired.

In the sale of gasoline, oil, grease, or any other supply or accessory a record is made on pink slips that are printed in rolls and a carbon copy is made on plain white paper that is also rolled. The entries are made with pencil. Each pink slip is numbered serially. The entry includes the date of the sale, whom the sale was made to, the make of the car, by whom the sale was made, the items and whether or not the transaction was cash or credit. The total amount received is entered and the slip is signed by the purchaser. The pink slip is given to the customer and the copy goes to the office. The stock room sells its supplies on the same general form. A receipt is made in duplicate and the original goes to the customer and the other to the office.

No vehicle is permitted to leave the garage without an order and that there may be no uncertainty the call or order is received by an operator at the telephone, who makes out the order and places it in a clip on a board, a copy of the order being made. This order remains on the board until the time for the car to be delivered or called for, and then the boys who take out or call for the cars take the order from the board and when the order has been filled the slip is returned to the office. The carbon copy is a check on the return of the original and it may be referred to at any time, so that if the boys do not return their sheets to the office a record is there by which they may be called to account. The order system precludes any possibility of an error or an order being forgotten.

Should there be order given for a car to be charged



WOODS ELECTRIC GARAGE
Twenty-first and Market Sts.
Owned and operated by
THE BARTLETT GARAGES, Inc.
PHILADELPHIA

No. — Date — 191
Name
Address
Tag No.
Make Car

CHARGES AGAINST CAR	AMOUNT
Storage days @	
Washing Car times @	
Polish Brass @	
Hrs. Repairs (see job card) @ per	
Gals. Gasoline @	
Pints Cylinder O. @	
Current K. W. @	
Sundries (specify separately)	
TOTAL,	

Received Payment,
By

ORDERS

Owner Sign

FORM VIII

THE WOODS ELECTRIC GARAGE
TWENTY-FIRST AND MARKET
PHILADELPHIA

Owned and Operated By
THE BARTLETT GARAGES, Inc.
J. C. BARTLETT, President

PURCHASE ORDER

To

Please deliver the following via

Quantity | For | Car. Style | No.
Battery | Plates | Style

FORM V

Express Shipments to No 11 N. 21st Street
Freight Shipments to 30th and Market Station, P. R. R.

BILLING INSTRUCTIONS
Invoices must show this Order No. 5206
Separate invoices for different Orders

CHARGE TO
THE WOODS ELECTRIC GARAGE

Date — No. — 191 — By

SHIPPING ORDER

Our No. — Their No.
Ship to
Via — Date
Charge to

FORM X

Remarks

Date of Order — Prepay / Collect
Req. Pgh. No. — Serial No.
Shipped — Signed
Charged — Signed

Form VIII, the Transient Card, Printed on Stout Manila Paper, 8.5 Inches Length and Four Inches Width, the Orders Being Signed by the Owner. This Card Serves for a Receipt. Form V, the Purchasing Order, 8.25 Inches Length and 5.5 Inches Width, Made in Triplicate on White, Green and Salmon Papers, the Original Going to the Firm from Whom Purchase Is Made, the Green Copy to the Customer's Envelope and the Salmon Copy to the Office Records. Form X, the Shipping Order, on White Paper, 8.25 Inches Length and 5.5 Inches Width.

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THE
WOODS ELECTRIC GARAGE
21st and MARKET ST.
PHILADELPHIA

100

Date ..... 191...

Sold to .....

Make of Car .....

Sold by .....

Amount Received .....

Received by .....

THE ABOVE NUMBER MUST BE WRITTEN IN BLANK SPACE BELOW, and THE CARBON COPY RETURNED TO OFFICE

FORM IX

CAR ORDERS

Date ..... Car Ordered ..... A. M. P. M.

Owner .....

Deliver to .....

Call for at .....

Order received by .....

Car delivered by .....

Carfare ..... O. K. by ..... Foreman.

Car to be charged .....

Special Orders .....

.....

REMARKS: .....

.....

Time spent ..... Hrs. ..... Min.

This slip must be properly filled out and returned to office immediately.

FORM XI

Form IX, Sales Slip, Printed on Pink Paper in Rolls and Numbered, a Carbon Copy Being Made on White Paper; Length Five Inches and Width 3.5 Inches—Original Goes to Customer with a Cash Sale and Copy to Office—Form XI, Car Order, Printed on Thin White Card Five Inches Length and 3.5 Inches Width, Is Filled in by Telephone Operator and Posted on a Board, from Which It Is Taken by the Boy Making Delivery of or Returning a Car.

or other work performed, similar record is made by the telephone operator. When trouble is reported by a driver or owner the condition is written on this slip and it is noted by the foreman, who gives such instructions as are necessary, and if it is a repair job this is taken care of by the repair order.

Transient cars are given a transient card filled in with the date, name, address, make of car, together with the license number of the machine. This card contains instructions to the superintendent on duty for the necessary garage work, covering, washing, polishing and storage. Also any instructions to the repair shop for adjustments. This card is signed by the owner, and is considered as an order, and at the completion of the storage is forwarded to the office. If payment is received the garage employee signs his name on the card, and it is surrendered to the office, and a cash receipt, showing the amount, is signed, and given to the customer.

Purchase orders are made in triplicate; the white being the original, is sent to the firm to which the order is given. The first copy is made on green paper, and if chargeable to a customer is entered on his bill, and then placed in the envelope assigned to him. The second copy, on salmon paper, is placed on file for check against the vendor's invoice.

All of the articles or material bought are purchased through these orders, and as they come into the garage are sent to stock room and credited on the ledger as stock, being entered to the stock account. As an article leaves the stock room it is put through an automatic stock book, which credits stock, and is charged to repairs, battery department or merchandise.

The regular accounts carried are: Repairs, Battery Department, Merchandise, Expense, Vehicle Sales, Vehicle Sales Expense and Equipment.

An automatic time clock in the hands of the telephone switchboard operator checks the arrival and departure of every single car in the garage, both night and day. This clock is locked and cannot be tampered with. This has been found to discourage so-called "joy riding" with customers' cars.

The same clock is used by the employees of the garage and shops to record the time of their coming and going, and this gives the pay master a report from which they are penalized if late. This card is used in addition to the regular time cards made out by the men at the completion of each day's work.

The organization of the garage includes the supervision of the president and vice president; the accounting is by the secretary and treasurer, and the

Page No. ..... LABOR BOOK Date ..... To .....

NAMES	Total Pay	Total Labor	Machine	Battery	Garage	W. & J.	Office	
Total This Page								
Brought Forward								
Sent Forward					FORM VII			

Form VII, Reduced Specimen Sheet from the Labor Book, Printed on White Paper for Loose Leaf Binding, 14 Inches Length and 8.5 Inches Width, Ruled in Columns for Entry of Dollars and Cents, and Cross Ruled Every Six Lines for Convenient Grouping of the Entries.

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sales manager supervises the salesmen, the demonstrations and displays at the shows. In the garage proper the vice president assumes the position of general superintendent and actually supervises the work and assumes all of the responsibility. Directly under him are the day superintendents, who control the day washers, polishers and cleaners; the stock room, the telephone service and night watchman; the night superintendent and his corps of washers, cleaners and polishers; and the superintendent of service, who directs the mechanics and the battery men. The office force consists of the bill clerks, accountants, cashier, stenographers, who are all under the direct supervision and direction of the general superintendent.

INTERESTING OMNIBUS BODY.

Detroit Concern Presents Novel Pay-as-You-Enter Type with Prominent Features.

The possibilities of the motor vehicle for omnibus service are being demonstrated in several cities throughout the United States and abroad, and within the past few months manufacturers who pay special attention to solving body problems have been working out plans which prove of decided interest. One such body, of the pay-as-you-enter type, has been produced by the Motor Truck Body Company, Detroit, a concern which has given much study to the subject. The result is shown in an accompanying illustration.

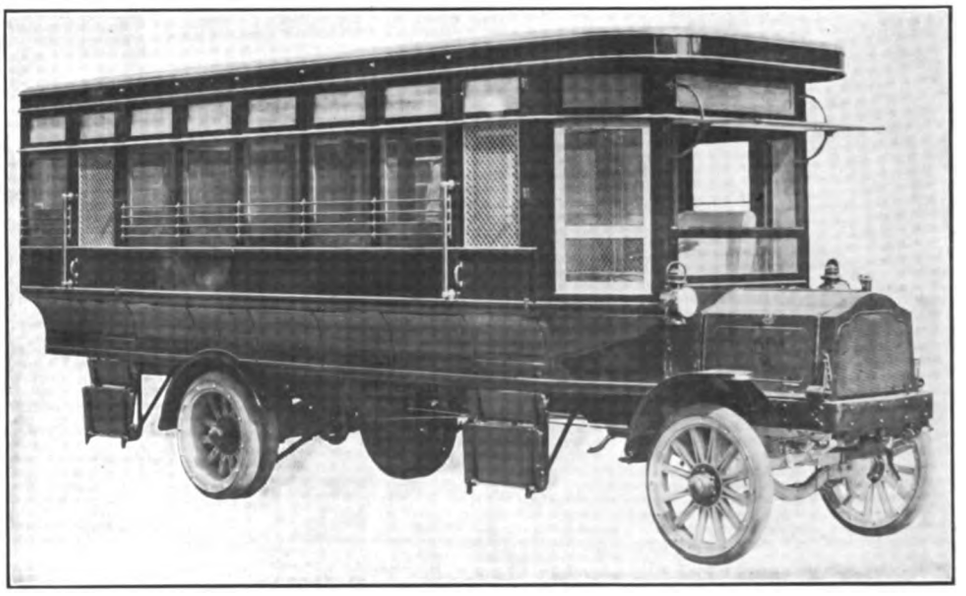
Seating accommodations are provided for 29 people, in addition to the driver. The arrangement and size of the seats are the same as in street cars and the driver's seat is separated from the rest of the body by a metal lattice partition, this extending along the back and side of the forward compartment to a sufficient height to prevent any interference with the driver by the passengers.

The illustration shows the doors closed and the steps folded against the side of the wagon. Both doors are provided with spring catches so that they may be operated separately from the driver's seat by substantial lever connection. When the door is opened the folding steps immediately release and offer means for entrance or egress. There also is a lever under each door so that it may be opened from the outside if deemed necessary.

The body is strongly built of well seasoned oak and ash. The sides are panelled with metal, and the windows are of the removable type, permitting them to be taken out during the summer months. Two ventilators are provided, one at either end of the car. All windows, doors, ventilators, windshield and other removable parts are equipped with rubber bumpers to prevent rattling.

The roof is substantially constructed, with cross sills attached to the side posts, and is covered with continuous wood sheathing and the highest grade of heavy water proof canvas in one piece without seams. This canvas is given one coat on the underside and four on the outside with white lead and linseed oil. The roof has sufficient arch to shed rain easily.

All side windows are provided with curtains mounted on spring rollers which when pulled down are of sufficient length to close the space between the roof and side panels. Each curtain has a cross stiffening rod, the ends of which slide in wooden guides attached to the posts. They are made of water proof material, such as is used in street cars.



Interesting Omnibus Body Produced by Motor Truck Body Company, Detroit.

The interior is equipped with electric lights of six candlepower each attached to the roof in such positions as to afford the best possible illumination. It also is supplied with two 40 ampere-hour storage batteries for lighting purposes.

In every respect the workmanship is thoroughly in keeping with the high grade material and the appointments. As an indication of the extreme care manifest in this regard, it may be stated that the body is treated with 13 separate coats of paint, and the exterior appearance is such as to cause unusual comment.

The Piatt Engine & Boat Company, 382 Atlantic avenue, Boston, well known in the motor boat trade, has added a new line of motor trucks suitable for use by grocers, provision dealers, launderers, farmers or any business requiring a light delivery wagon. The new truck is of 1000 pounds capacity.

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LANSDEN ELECTRIC VEHICLES FOR 1913.

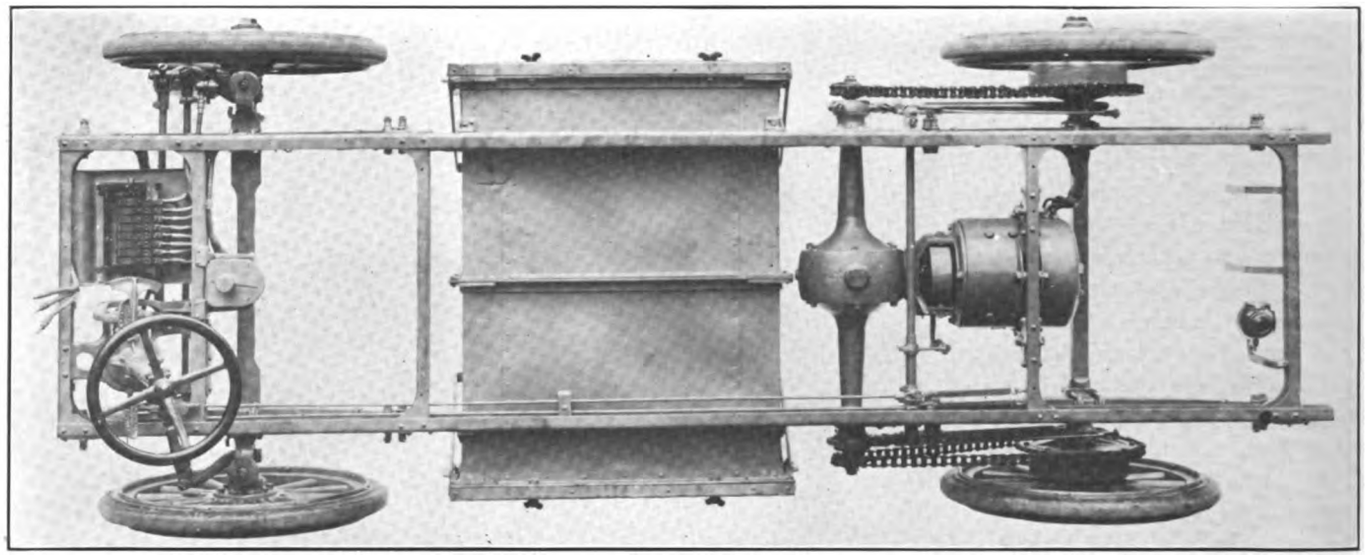
THE Lansden Company, Newark, N. J., a concern that claims the distinction of being the oldest corporation in America that confines its activities to the production of electric service wagons and trucks, has built these vehicles for more than nine years, the first machines being placed in operation early in 1904. During this period wagons and trucks of differing sizes were produced and utilized for varying purposes.

With the experience gained the company improved its vehicles from time to time as the conditions of use and the progression in electric vehicle engineering justified, and while the earlier types gave excellent satisfaction the desire was to reach a standard that could be continued for an indefinite length of time and compare favorably with other machines in the market.

The Lansden vehicles have been in the service of some of the well known concerns in the metropolis and have for years been used with a material degree of satisfaction, enduring consistently and giving a mileage that was sufficient for all ordinary requirements in urban haulage. The purpose of the company was to perfect these so far as possible and during the summer and autumn of 1911 a number of improvements, some of which may have been regarded as radical, were made in the design of the machines under the direction of Chief Engineer H. E. Heath. It should be stated that the vehicles of differing sizes are all made to the same general design, this being with a purpose of standardization.

These improved wagons and trucks showed in service that a great advance had been made in operating efficiency and in endurance as compared with previous productions, but the Lansden company was not satisfied with the results. It was believed that a still higher degree of serviceability could be obtained, and to attain this the endeavors of the engineering department were directed toward perfecting the design designated as the 1912 model or type. The company did not hesitate at expense to refine its design and the machines were developed to secure the greatest simplicity, compactness and convenience in attention and maintenance, as well as insuring the efficiency as the highest practical point.

In this work of refinement the company's experts and specialists have been busy for a long period, giving attention to every factor entering the general problem, and under the direction of Frank Mueller as chief designer, Mr. Mueller having been for years associated with Mack Brothers Motor Car Company, Allentown, Penn., and for a considerable part of that association in charge of that concern's development work, has produced and is now manufacturing an improved truck, which is known as the Lansden 1913 model. The vehicles as perfected are regarded by the maker as being worthy of the attention of all persons engaged or interested in haulage.



Top Plan View of the Lansden Chassis, Showing the Three Point Suspension of the Motor and the Driving System.

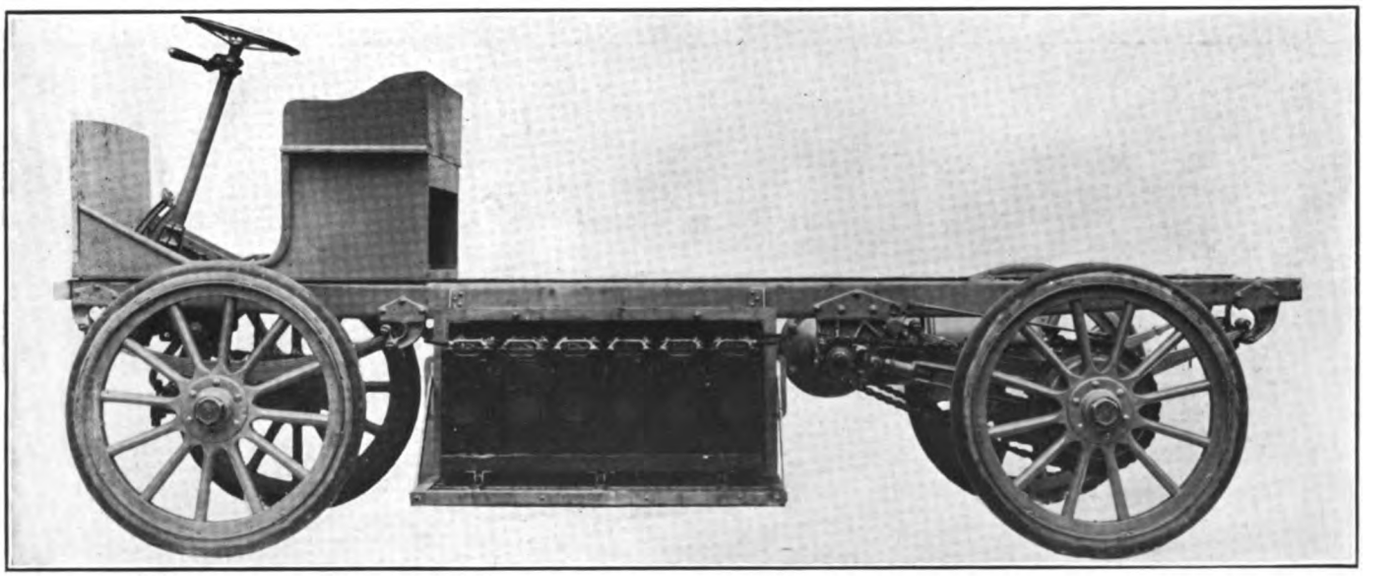
The purpose of this article is to describe the improved chassis and the qualities that are claimed for it by the maker, illustrating the mechanical construction and the features which are regarded as being of distinct character and of unusual value to the user. Reference to the accompanying illustrations will make clear the characteristics of the design.

Examination of the chassis will show that the vehicle is driven by a single motor with a first reduction by a bevel gear and the second by the usual sprockets and double side chains, the motor being energized from a battery carried in an improved cradle, or battery box. It will also be noted that the motor is located in the longitudinal centre of the chassis frame, forward of the rear axle, and that it is suspended from a strong cross frame member, the armature shaft paralleling the frame, and the motor shell is bolted to a spider that is fixed to and forms part of the jackshaft differential housing, making the motor and jackshaft assem-

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bly practically one unit. This construction gives a three point suspension for the motor and jackshaft. Another quality is the shutting off of all electrical energy when the service brake is applied, this giving the full power of the brake for controlling the movement of the vehicle. The value of this device can be understood by those who have experience with braking any vehicle with the motor in operation. The company has protected by patents the drop-door roller platform battery box, the unit three point suspension motor and jackshaft drive, and the controlling mechanism, and it is maintained that these are original with this concern.

In the design of the chassis endeavor was made to secure the simplest construction, with a view of minimizing the time necessary in attention and in maintenance, and to insure an endurance and dependability that could be relied upon through long periods of service, and yet with a view of reducing the weight proportionately and maintain the strength and reliability so essential.



Side View of Chassis, with Battery Box Open, Illustrating Ease of Access and the Simplicity of Construction.

The power plant of the chassis is a series wound construction that is built to have unusual endurance, the materials being of high grade throughout and with ample margins of safety. The armature shaft is large and of special quality steel, and it is mounted in Hess-Bright ball bearings of the annular type. The motor is enclosed in a steel housing and it is water and dust tight. The machine is designed to have an overload capacity of 300 per cent. for 30 minutes, and momentarily it has a much larger productiveness without injury. The motor is suspended by a clamping band or strap from a strong frame cross member and it may be released from this by removing two bolts, easily accessible from beneath the motor. Bolted to the forward end of the motor housing is a heavy cast steel spider and the extension of the armature shaft carries a service brake drum that is within the spider, the external contracting band of the service brake being actuated by a lever. The armature shaft extends beyond the brake and passing through a stuffing box it enters the differential housing, the pinion on the forward end of the shaft engaging with the bevel drive gear of the jackshaft. The spider is a part of the jackshaft housing, and as the motor and its shaft are held rigidly in alignment, no distortion of the chassis frame will cause side pressure leverage upon the shaft or its bearings.

The jackshaft housing is composed of three parts, the centre section, which forms the differential housing, and which is webbed on the under side to insure strength, and the two side sections which house the axle shafts. These two side members are bolted to the centre section, so that the motor and jackshaft form a complete assembly. The differential is of the bevel gear and pinion type and it is mounted in heavy bearings, the gears being of special steel and intended to be very enduring. The shafts are of nickel steel, heat treated to insure strength, and they are carried in heavy bearings at the outboard ends. All the bearings are of the Timken make and are adjustable for wear. The jackshaft sprockets are extra heavy and are also specially designed for heavy duty. When assembled the jackshaft is operated in oil and is always fully lubricated, the stuffing box preventing leakage of the lubricant.

The jackshaft is mounted in heavy brackets below the chassis frame and these are so designed that the jackshaft may be removed with comparative ease when necessary. On the outboard ends of the jackshaft housing are mounted the forward ends of the radius rods, which are fitted with ball and socket bearing so that the stresses are compensated and the spring motion is free. These connections or bearings are adjustable for wear. There is a filler cap in the jackshaft differential housing by which the lubricant may be supplied.

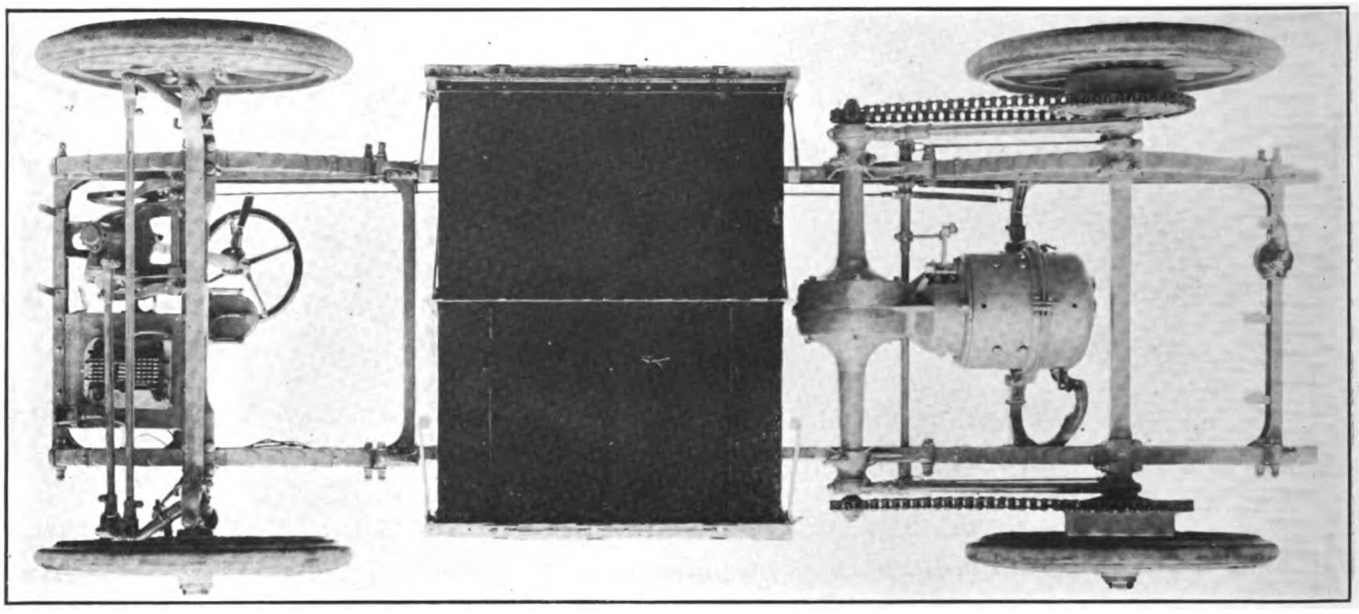
The chassis frame is a channel section of special steel and there are five cross members, three forward of the battery box or cradle and two back of the jackshaft, these being formed with integral gussets and

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are double heat treated. Besides these the battery box and the brake shaft and the jackshaft strengthen the frame to a very large degree. All the members are hot riveted. The spring horns, spring hangers and the jackshaft brackets are heavy steel castings, one bracket carrying the jackshaft, brake shaft and forward rear spring shackles, all of which are similarly riveted to the frame.

The springs are semi-elliptic that are installed without perforation and are of chrome manganese steel, oil tempered, and are designed to have great durability and afford easy riding qualities. The spring eyes are bronze bushed and the bolts are hardened and ground and are fitted with grease cups of large proportions to insure constant lubrication. The bushings are renewable when wear makes this necessary.

The rear axle is an extra heavy nickel steel forging that is double heat treated and is designed to resist unusually severe service. The axle spindles are very large and are fitted with Timken roller bearings.



Bottom Plan View of the Lansden Chassis, Displaying the Jackshaft and Motor Suspension and the Control Mechanism.

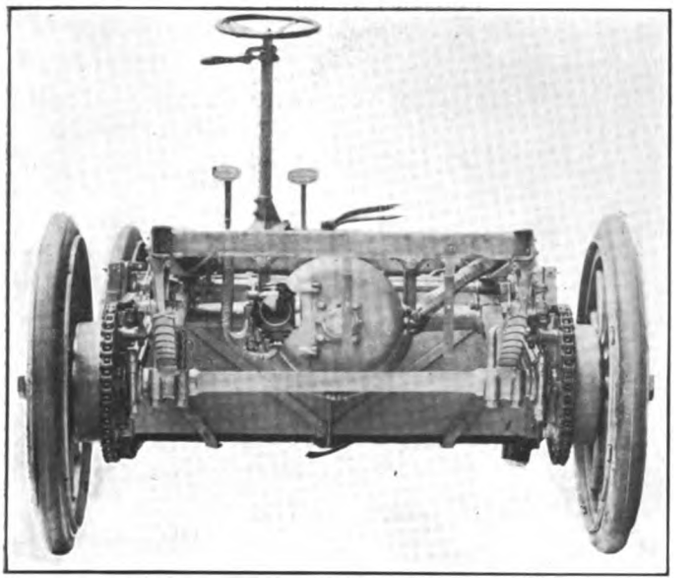
The front axle is an I section, drop forged of nickel steel, and has very large yokes. The steering spindles are drop forgings of unusual size and these are mounted with Timken roller bearings. The spindles are also fitted with bearings of the same make. The wheels are of artillery type and are made of carefully selected material to the standard dimensions of the Society of Automobile Engineers. The rear wheel construction is unusual in that the hubs and brake drums are combined in single castings, the design making for great strength and insuring against stresses when the wheel brake is used. The brake drums are large in size and will endure for years in constant use. All wheels are mounted on Timken adjustable bearings. The tiebar and the drag link are both heavy and are carried in front of the front axle, where they are easily accessible.

The battery box or cradle is of the side-loading type illustrated and these are constructed of steel channels and angles, cross braced and reinforced where necessary. The box is suspended from the chassis frame by steel brackets that are hot riveted to the side members. The side doors are designed to drop and are held by stout guides in a horizontal position so that the battery crates may be drawn out on to them for examination or work, and the crates are carried on wooden rolling platforms, there being channels on the floor of the battery cradle and the doors in which the rolls move transversely. It is possible to handle the battery crates with comparatively little labor and very quickly. The entire construction is light and exceedingly strong.

The control of the vehicle is exceedingly simple. Both service and the emergency brake are operated by foot pedals of the receding type placed at either side of the steering column. The service brake pedal is at the right of the column and it is so designed that the controller is returned to the "off" position when the brake is applied, and the controller cannot be used until the pedal is released and the brake is free. This prevents the operation of the motor so long as the brake is in service and there is no possibility of the brake being dragged, using the current unnecessarily and imposing excessive strain on the motor and the transmission system. The service brake is located on the extension of the armature shaft between the motor and the jackshaft. The emergency brake pedal is at the left of the steering column and it has a ratchet lock attachment so that the brake may be locked so long as desired. There is a supplementary lever release pad and the brake is with internal expanding shoes within the drums on the rear wheel hubs. The brake levers are long and the brakes are easily operated with moderate pressure, the rods being with direct pull and the leverage is positively applied.

The steering gear is a high grade worm and sector construction that is fully enclosed and packed with grease. Being dust and water tight there is but little

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Rear View of Lansden Chassis, the Brake and Wheel Construction Clearly Shown.

reason for wear and there are adjustments for compensation when the parts become worn. The steering column is at the left side and the post is slightly inclined. The steering head and post, controller tube and brake pedals are carried on a single casting with a bell shaped cap to give additional support and protect the controller operating mechanism.

The controller is a continuous torque type of the latest construction with four speeds forward and two in reverse, that is fully enclosed and protected, and it is gear operated by a handle on the steering post, located at the left side of the wheel, the position being decidedly accessible. The vehicle movements correspond to those of the controller, being forward with the advance of the handle and reverse with the backward movement. There is also a locking device by which it is possible to prevent the use of the machine by any person unauthorized to operate it. The controller resistance is fireproof mica insulated and it has cast iron units, the assembly being protected by a metal casing. The safety switch is a special design that has a large overload capacity and its form is very compact. It is enclosed in a dust and fireproof casing and provided with a key that is removable when in a charging or open circuit position, but is held in the switch when thrown into the position for vehicle operation.

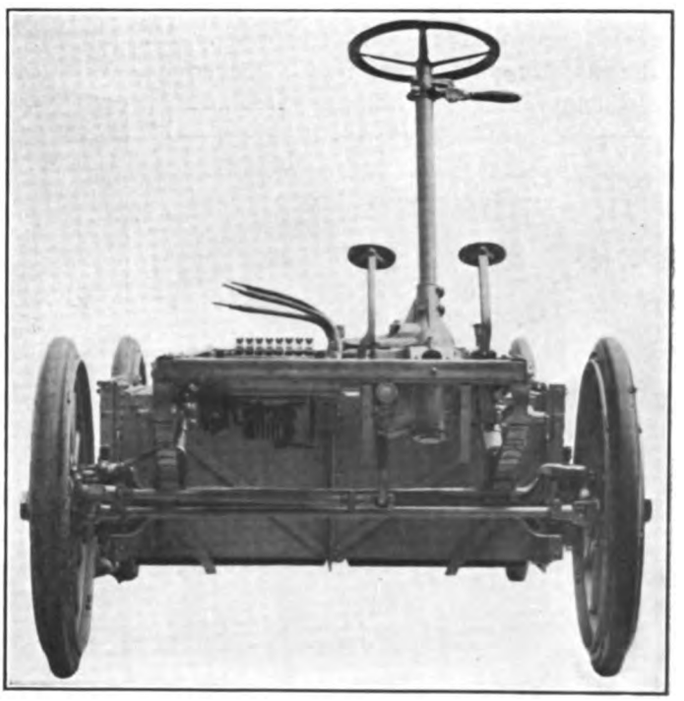
The battery is a latest type Edison of sufficient capacity to give more than the rated mileage, the number of cells, 60, being what is necessary to permit charging from the usual 110-volt circuit with the least possible external resistance. The charging receptacle is of standard make with enclosed concentric contacts and a spring-hinged cover. All of the power wiring is made with flexible heavy rubber-covered cables of double normal current capacity, protected by special wrapping, insulating varnish and fibre wherever necessary to prevent wear. The wiring is further protected, yet is decidedly accessible, by being run in the channels of the chassis frame.

The tires are selected to secure the size and quality best suited for the conditions of service, high efficiency and durability being two of the factors governing the selection. While strength and endurance have not been slighted in construction to secure minimum weight, care in designing and choice of materials have resulted in the production of vehicles as light as are consistent with the requirements of the rigorous service the trucks are built to withstand.

The vehicles are made with load capacities from 500 pounds to five tons and have been demonstrated to have unusually high efficiency and endure under the hardest operating conditions. They are simplified to forms consistent with satisfactory operation, and in practical service will undoubtedly prove the best machines that have been produced by this concern.

BOSTON ELECTRIC VEHICLE CLUB.

The Electric Vehicle Club of Boston at its first autumn meeting, held Sept. 12, voted to make the organization self-sustaining and a committee was appointed to draft a constitution and bylaws and to establish an annual due for membership. It was the belief of the members that the body should be independent and that it would be a large influence in the promotion of the use of the electric vehicle with energetic endeavors. W. A. Weatherby, representing the Anderson Electric Car Company, was appointed to the advertising committee to fill a vacancy. The plans for the entertainment of the delegates to the third annual convention of the Electric Vehicle Association of America were considered and determined, and there were addresses by William W. Scott of the MOTOR TRUCK, Frank J. Stone of the Electric Storage Battery Company, Converse D. Marsh and by representatives of the daily press.



Front View of the Lansden Chassis, Demonstrating the Control Levers and Pedals.

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ELECTRICAL EQUIPMENT FOR THE GARAGE.

Electro-Mechanical Devices Specially Designed to Economize Labor and Insure Greater Economies in Public Station--The Facilities of Today.

By Charles L. Benjamin.

IN THE early days of the automobile when the lines of the car were modelled upon those of the horse drawn vehicle (just as the early railway car differed little in appearance from the stage coach it supplanted)—in those early days of an infant industry which has since grown to giant proportions, it was natural that the bicycle repairer of the town and the local delivery man should join forces and open the first garage. They were the logical men for the job. But the nature of the job has changed and with the change has come a demand for a type of man possessed of higher technical knowledge, broad business experience and larger capital.

The management of a modern garage calls distinctly for a high-grade man, with a corps of capable mechanical assistants, one of whom at least must be an electrical expert. The extent to which electrical apparatus is used in this industry cannot be fully appreciated unless one passes in mental review the various applications of electricity to be found in an up-to-date garage. Ten or 15 years ago one word would have sufficed—"lights." Today an article filling several pages of the MOTOR TRUCK permits of only the most superficial treatment of the subject.

Passing over the matter of electric lighting with its array of cables, conduits, switches, junction boxes, fuses, lamps and fixtures, etc., we proceed at once to what may be called the electro-mechanical equipment of the garage. This will include the motors, starting rheostats and speed regulators used in the repair shop, rheostat for vulcanizer, motor driven air compressor for inflating tires and supplying air blast for blowing dust out of upholstery, charging rheostats for the ignition batteries and lighting batteries of gasoline cars and for the storage batteries of electric vehicles, and—in the case of the garage maintaining its own power plant—an engine-generator set. Garages of more than one story in height will also be equipped with an electric freight elevator and probably with motor driven pumps and suitable starting apparatus for fire pump service. Provision for suitable ventilation will also call for motor driven fans and blowers.

The battery charging rheostat is one of the most necessary pieces of equipment for the modern garage, especially so if charging electric vehicles forms any considerable portion of the business. In a garage now being completed for the American Express Company in New York City—probably the largest private garage in the world—no fewer than 300 Cutler-Hammer charging rheostats will be installed. Incidentally, the fact that this great express company is preparing to handle all of its New York business with electric vehicles is an indication that the motor truck is at last receiving the consideration to which its many advantages over the horse drawn vehicle entitles it.

The increasing use of the electric vehicle calls for garages especially adapted to this class of service. When local business men have failed to grasp this opportunity the vehicle manufacturer sometimes takes the initiative himself. The case of the Anderson Electric Carriage Company's garage at St. John's place and Bedford avenue, Brooklyn, is an example of a manufacturer stepping in

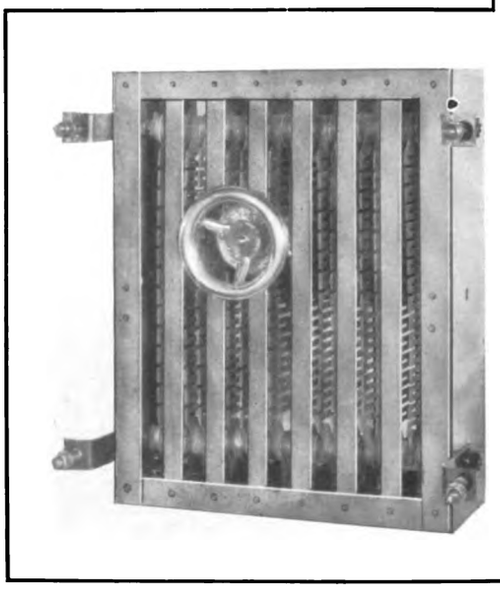


Fig. 1—Charging Rheostat for Mounting on Rear of Switchboard.

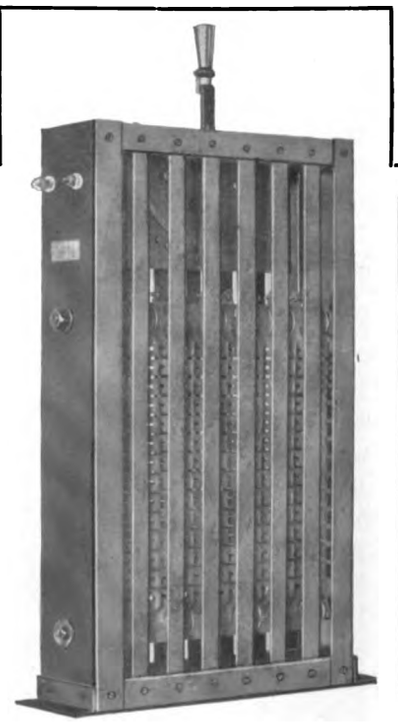


Fig. 2—Charging Rheostat, Floor Type.

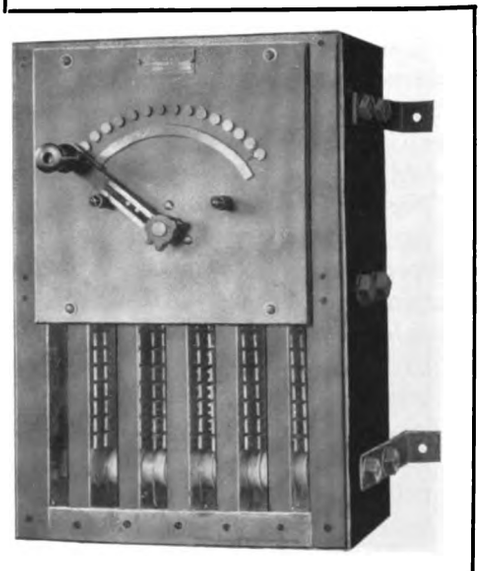


Fig. 3—Charging Rheostat for Mounting on Wall or Front of Switchboard.

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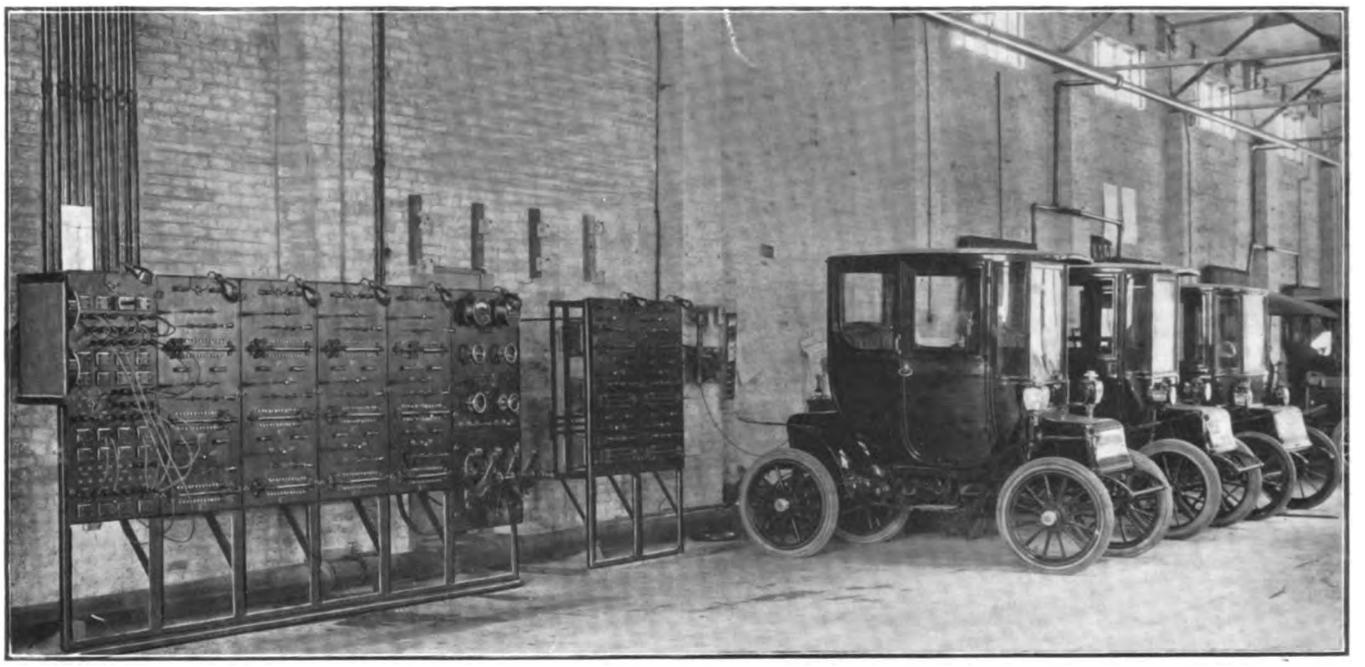


Fig. 4—View Showing Cutler-Hammer Battery Charging Panels in Kopmeier Garage, Milwaukee, Wis.

to provide the necessary garage and expert charging treatment for both pleasure and commercial vehicles. This garage was completed about a year ago and a description of the charging equipment may be of interest.

Thirty vehicles can be charged at one time and the charging equipment is suitable for charging truck and cars using the nickel-iron or the lead battery. The equipment and general layout of the garage received careful consideration. There are 30 charging outlets, three outlets being grouped at each of 10 stands. The station is very clean and roomy. All lighting circuits are run in conduits and all battery circuits are run from the charging board to the outlets in conduits under the floor. The charging outlets are located about one foot above the floor.

The Cutler-Hammer charging rheostat panels shown in the illustration, Fig. 9, are so designed as easily to be augmented. Each panel is a charging unit in itself except the one at the right. This panel carries at the bottom a three-pole main line knife switch and fuses, one charging unit for charging three cars, an additional charge-discharge switch for discharging any battery on the circuit through the charging rheostat, and a charging rheostat for charging ignition batteries. The small swinging panel carries the voltmeter and a zero-centre type ammeter which indicates in one direction on charge and in the other on discharge.

The other three panels are all alike, each being a complete frame so that when more charging outlets are required it will not be necessary to make any changes on the original equipment. The only connections between the frames are the main busbars, which are mounted near the top of the back of the panels. The connections to the battery-charging circuits are made at the bottom of the panels.

The three outlets at each of the 10 charging stands

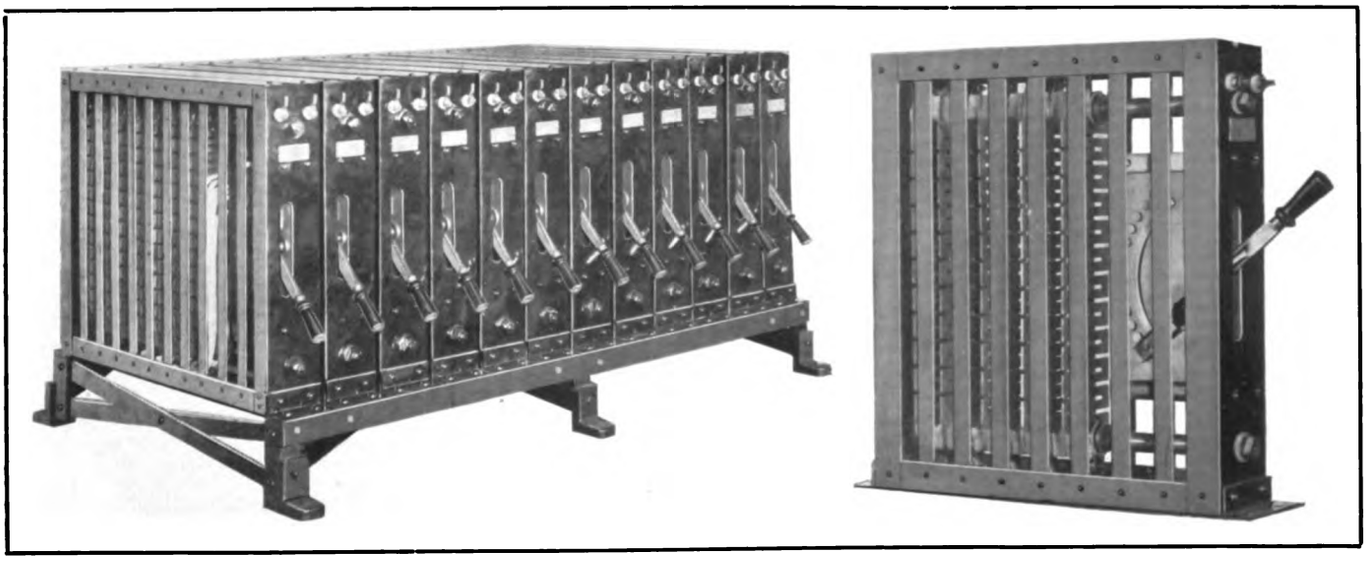


Fig. 5—Row of Type C Charging Panels.

Fig 6—Single Type C Charging Rheostat Unit.

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are connected in series and these can be connected by means of a double-pole, double-throw switch to either the 110-volt or the 220-volt circuit. If only one car is



Fig. 7—Charging Panel Particularly Suited for Charging Pleasure Vehicles in the Private Garage.

being charged, the switch is closed in the 110-volt position. When two cars are being charged at the same rate they can be connected in series on the 110-volt circuit, at least for starting the charge (unless the combined counter voltage of the batteries is in excess of 110 volts). For finishing the charge the batteries are connected on the 220-volt circuit. By this means less energy is wasted in the resistance of the rheostat. For three cars the switch is thrown in the 220-volt position for the entire charge. The fact that the three outlets of each stand are connected in series does not prevent cutting out any car. Another may be substituted, or the vacant outlet or outlets may be short circuited by means of plugs provided for the purpose.

One pilot lamp is provided for each outlet, which burns when the battery is plugged in, indicating to the attendant at the board at all times the outlets in use.

The double-throw switches of the charging panels are arranged so that in the 110-volt position, with all circuits in use, the system is balanced, half the switches being connected to one side of the three-wire system and half to the other side.

The rheostats are arranged for a large number of steps over a wide range to secure fine regulation. Each rheostat except the one designed for charging ignition batteries has two sliding contact arms, one of which is provided for the large steps and the other for the fine adjustments of current. Ten steps of the latter equal one of the former.

Each circuit is provided with a single-pole ammeter switch, giving a reading on its particular circuit. This switch is designed so as not to break the circuit during the period of throw-over. The reading obtained, therefore, indicates the exact condition of the battery. The garage is supplied with energy over a three-wire, 230-115 volt service from the Edison Electric Illuminating Company of Brooklyn.

The illustration, Fig. 4, shows the charging panels installed in the Kopmeier Garage, Milwaukee. Each panel has three charging rheostats of the slider type, the grid type resistance being mounted on the back of the panel. There are between 50 and 60 pleasure vehicles cared for here and about the same number of gasoline automobiles.

The latest types of battery charging panels have a number of important features which are in line with the other advances made in the electric vehicle industry. On these panels the arrangement is such that the instrument switch does not open the main circuit and burn and roughen the switch blades every time a meter reading is taken. This arcing is especially severe on large equipments where 150 to 200-ampere currents are broken, as anyone having experience with opening knife switches under such conditions well knows. The latest panels are designed to allow the operator to get a reading of the battery voltage and charging current by a movement of a single switch lever, without the breaking of the heavy charging circuit. This method of getting readings is much more convenient also than the method which required an ammeter switch and voltmeter plug. The operator has just the one thing to do—move a single switch lever—and (especially in large garages) cutting down the number of things the operator must do, is of considerable advantage and encourages the taking of frequent readings since it entails little inconvenience.

Another reason why the plug system is being su-

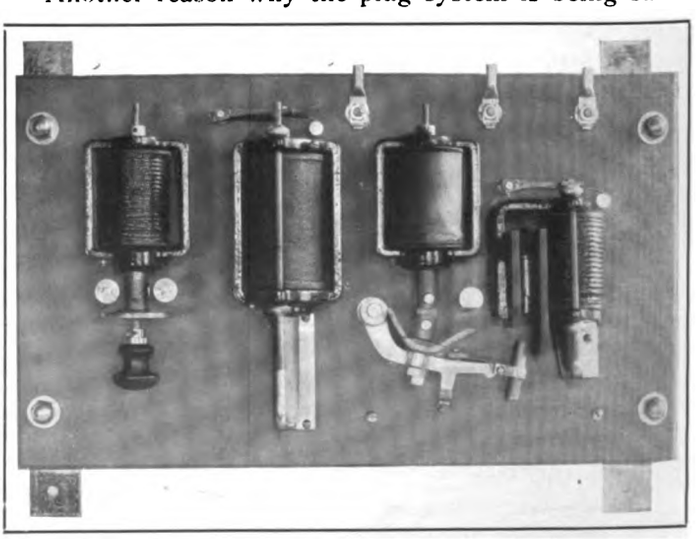


Fig. 8—Automatic Protective Devices.

perseded is that where there are several panels, each having a plug, short circuits are liable to occur. This is due to the fact that after one reading is taken the

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plug may be left in place and when the next reading is desired on some other rheostat of the same panel the plug of the adjoining panel may be used. This

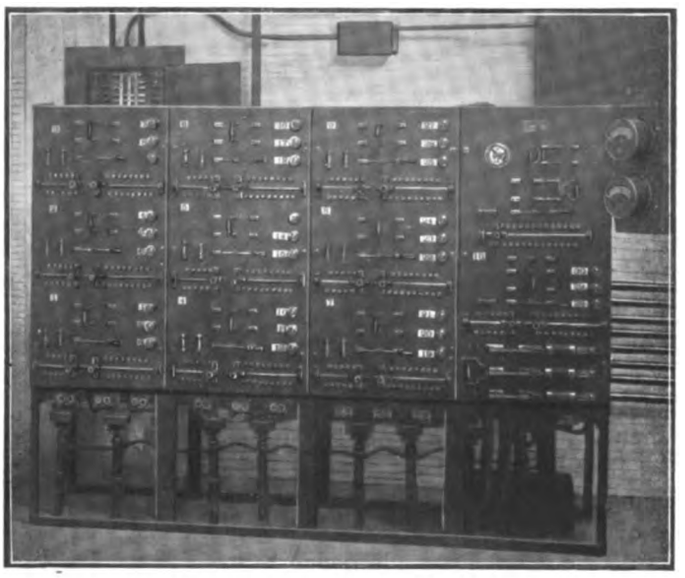


Fig. 9—Battery Charging Board, Anderson Electric Car Company, Brooklyn, N. Y.

will at once cause a short circuit and blow all the fuses on the board. Some other method of securing readings is therefore desirable. Arranging the charging rheostat with its operating handle directly alongside of the main knife switch and instrument reading switch for that particular rheostat makes accidental short circuits impossible. Each group is a unit in itself and is connected to its own charging outlet. The operator knows by a designation, such as a number, which charging rheostat to operate when charging a car at any of the charging outlets.

Convenience or ease of operation of the rheostat arc of course is necessary. The charging equipment, therefore, should be arranged so that all rheostats and switches are within reach of the hand. There may be a few cases where, because of lack of space, the rheostats must be mounted above the switchboard and the lever pushed up or down by means of a cane with a hook or ring at one end. However, as a general thing, this is not good practise and in the equipments built today the design avoids this arrangement if possible.

As the number of vehicles cared for by a garage is bound to increase with the increasing popularity of the electric pleasure and commercial vehicle, the battery charging equipment should be installed so as to allow for additions. The charging panels should be of such design as to be easily augmented to provide for additional charging outlets. As with the filing cabinet system it should be possible to add units in rows stacked in various heights whenever needed.

Each of the two panels of the charging board shown in the illustration, Fig. 13, has assembled on it eight charging rheostats to take care of eight separate charging outlets. Moving the lever over the contacts arranged in an arc of a circle gives the various currents required. The resistance which is mounted back of the slate panels is of the grid type. No meters are shown as for this particular case they were mounted on a swinging frame to the left. This entire switch board is only 56 inches wide and the uppermost switch and lever can be easily reached by anyone of average height.

Charging rheostats such as the floor and wall type units are for use in private garages where there may be only one or two vehicles and where the operator in attendance has considerable knowledge of electricity. They are built for use on direct current circuits ranging from 110 to 115 volts and are designed to charge the battery at the maximum rate until the cells are nearly fully charged, then at the minimum rate until the battery attains to its maximum voltage, which is the method of charging generally practised.

Where a direct current circuit of 125 volts or less is not available for battery charging it is usually more economical in the long run to use a motor-generator set, the generator being designed to deliver direct current at 110 to 115 volts pressure. Where alternating current only is available a motor-generator set must also be used, the

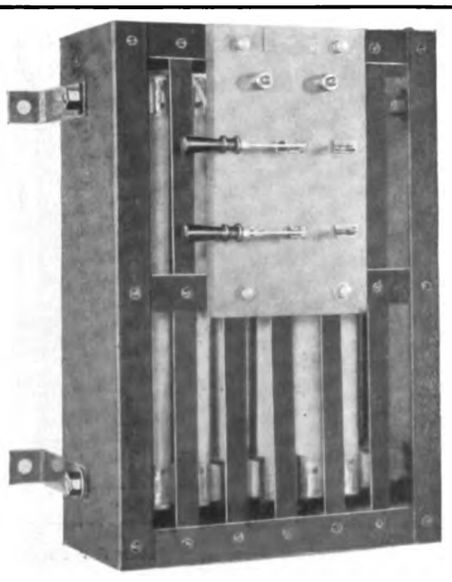


Fig. 10—Ignition Battery Charging Rheostat.



Fig. 11—Automatic Low Current Cut-Out, Lever Type.



Fig. 12—Ignition Battery Charging Rheostat.

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motor being an alternating current type and the generator the same as in the preceding case. In either of these cases the additional equipment necessary besides the motor-generator set consists of a starter for the motor and switchboard having generator field rheostat, switches and meters for obtaining readings of the generator current. The rheostats illustrated in Figs. 5 and 6 can be mounted below the charging switchboard panel or above. When placed above, however, it is necessary to operate them by means of a cane and hook, which is not very satisfactory except in cases where just a few are used.

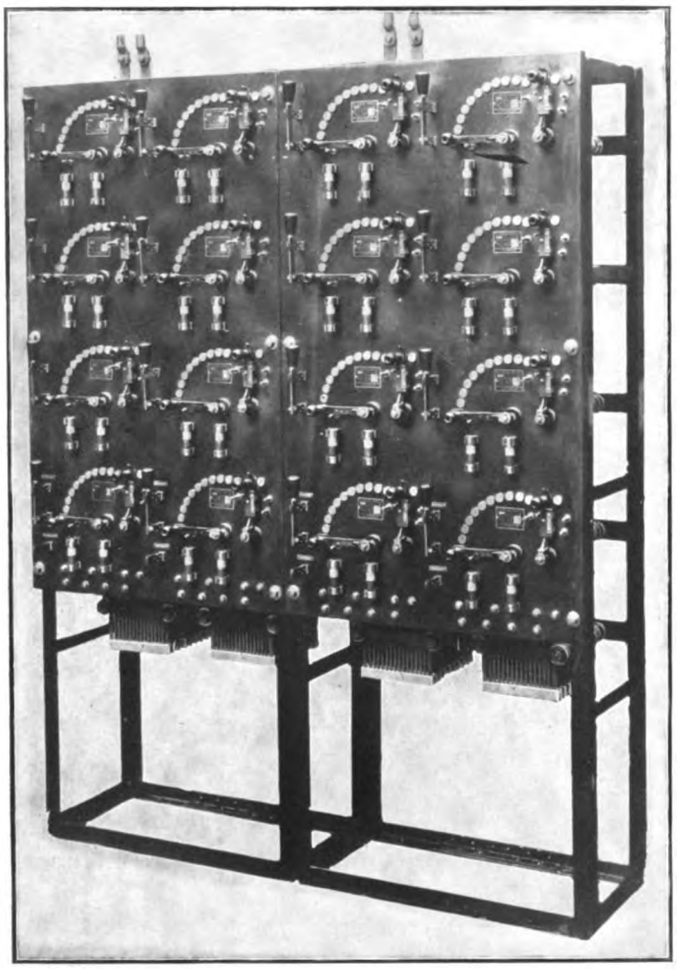


Fig. 13—Two New Type Cutler-Hammer Battery Charging Panels, Each Consisting of Eight Rheostats.

The charging panel shown in the illustration, Fig. 7, is especially designed for the private garage where automatic charging is desired and protective devices that will insure battery from damage are required. These protective devices, which are shown at the bottom of the panel, are also used where a complete panel of this type is not required. For this purpose they are mounted on a separate panel as shown in Fig. 8, the devices being, beginning at the left, a low current (disc type) cut-out, maximum voltage cut-out, main line solenoid switch and overload circuit breaker. When installed as a separate device as illustrated in Fig. 8 the protective panel is put into operation by raising the plunger of the low current cut-out until the disc mounted on the plunger comes in contact with the disc posts. This admits current to the solenoid switch which closes the main line circuit. The maximum voltage cut-out automatically opens the circuit when the battery voltage reaches the point at which this cut-out is set to operate, while the overload circuit breaker serves to protect the battery against excessive currents. Failure of current will result in de-energizing the low current cut-out which in turn de-energizes the solenoid switch opening the main line circuit.

The disc of the low current cut-out is held in contact with the disc posts as long as a sufficiently strong current continues to flow, but upon a decrease in current to approximately one-fourth of normal, the magnetic attraction of the solenoid weakens and the plunger drops opening the circuit. However, when desiring to manually open the circuit this plunger should not be pulled down, but the main line knife switch should

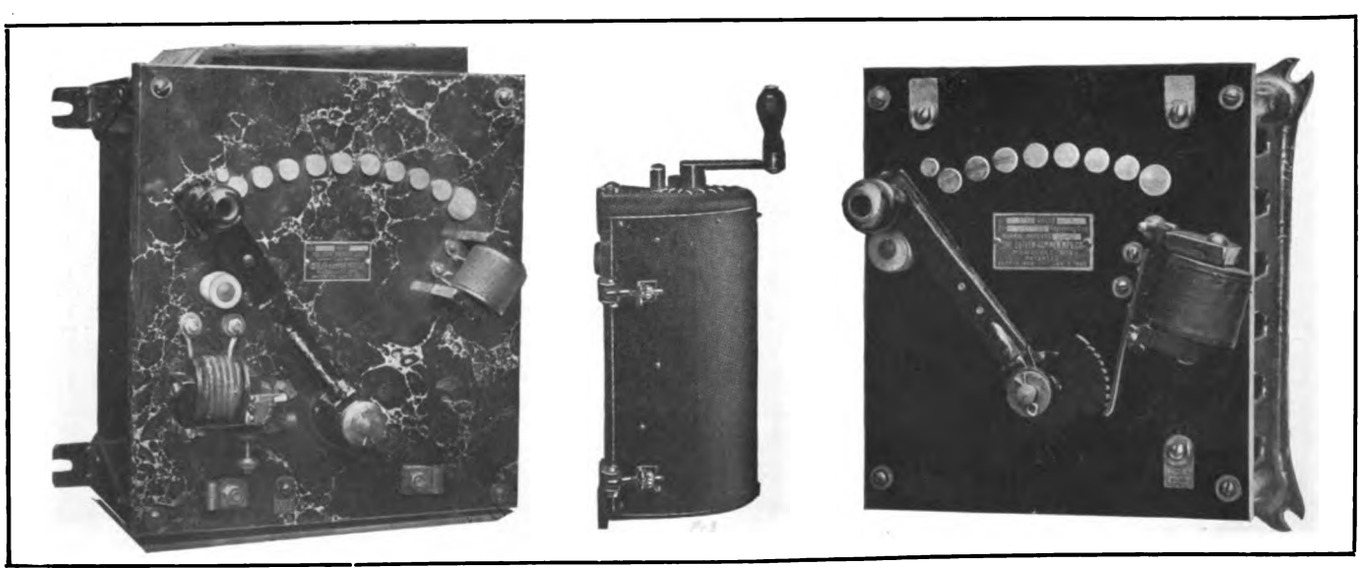


Fig 14—Motor Starter for Direct Current Motors.

Fig. 15—Controller for Motor Operated Machine Tools, Lathes, Etc.

Fig 16—Motor Speed Regulator for Fans, Pumps, Etc.

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be opened. This will result in the weakening of the solenoid of the low current cut-out which allows the disc and plunger to automatically open without injurious arcing.



Fig. 17—Regulator for Varying Temperature of Vulcanizers.

The lever type of low current cut-out, Fig. 11, consists of a lever pivoted at one end and carrying a laminated copper contact brush mounted near the hub, the lever being held normally in a horizontal position by a retaining magnet in series with the battery. Upon a decrease of current to approximately one-eight of normal the magnet releases the lever which falls of its own weight, opening the circuit.

As in the case of the disc type low current cut-out described, a handle is provided for closing the circuit manually, and the caution against forcibly opening the circuit of the disc type cut-out while full voltage is present applies also to the lever type, the contacts of these devices being designed to open circuit on low voltage only.

As many garages take care of both electric and gasoline cars, small charging rheostats especially designed for charging ignition batteries used on gasoline automobiles are included in the electric equipment. The illustrations of two types are shown in Figs. 10 and 12. One of these is for mounting on the wall or switchboard and is operated by the lever at the top. The larger type carries a slate panel and two single-pole knife switches, the closing and opening of which varies the charging rate.

Besides charging rheostats there are other devices included in the electric equipment of the garage. Electric lighting is the best means of illumination and frequently it is desirable to have all-porcelain sockets and switches, such as are illustrated in Figs. 18 and 19.

Porcelain is not attacked by acid vapors and other gases and as most garages are built without basements and have cement floors built on the ground the porcelain devices prevent shock when handled. An electric vulcanizer is now part of the equipment of many garages and the small six-inch regulator shown in Fig. 17 is used for varying the current in the vulcanizer which regulates the heat.

In the repair shop the motors used for driving the machine tools will require some kind of speed controller. The small drum type controller illustrated in Fig. 15 can be mounted directly on the machine and gives the operator easy means for varying speed to suit the work he is doing. For motor driven pumps, ventilating fans and similar types of machinery the speed regulator, Fig. 16, is especially adapted. This is similar in appearance to the Cutler-Hammer motor starter, Fig. 14. Where simply a constant driving speed is desired the only controlling device that is required is the starting rheostat, which provides means for bringing the motor from rest to full speed. The lever is passed over the successive contacts from left to right, gradually increasing the speed. Automatic controllers are used to a considerable extent with compressors and pumps also.

Because of the fact that so much of the success of the electric garage depends upon the electrical equipment the selection of apparatus should receive careful consideration. The increasing use of the electric vehicle will stimulate the establishment of garages and every day's experience will mean the betterment of conditions in the electric vehicle field.

CONTINUE SUMMER SCHEDULE.

United States Tire Company Finds It Necessary to Work Three Shifts All Winter.

All of the United States Tire Company's factories will be operated during the coming winter on full summer schedule, which means that they will be run night and day, three shifts of workmen being employed. The decision to continue this plan, begun last year, was reached at a conference at New York City between General Manager J. M. Gilbert and the company's factory managers, W. McMahon, Detroit; J. M. Patterson, Providence, R. I.; Harlow W. Waite, Indianapolis, and C. B. Whittlesey, Hartford, Conn. The conference was under the direction of C. J. Butler, vice president of the company and supervisor of production.

Last winter was the first time in the history of the tire industry that it was considered necessary to maintain a full summer working schedule throughout the so-called "off" season. The plan worked so satisfactorily that its continuation was decided upon. The four factories produced more than 1,250,000 tires during the year and their 1913 output will be far in excess of this number, the equipment of each having been increased and a new plant, the largest of its kind in the world, being in contemplation.

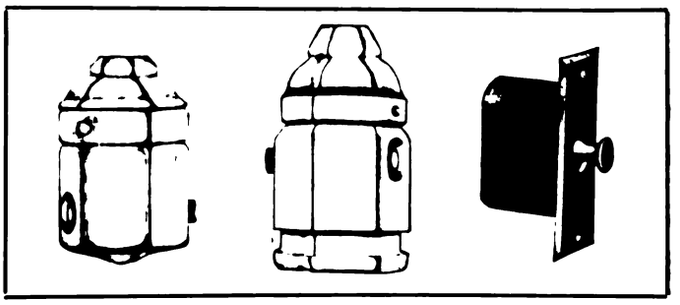


Fig. 18—Porcelain Pendant Switch.

Fig. 19—Porcelain Push-Button Socket.

Fig. 20—Automobile Battery and Lighting Switch.

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ELECTRIC VEHICLE ASSOCIATION OF AMERICA.

By Harvey Robinson.

NOT only in the motor truck field, but in all American industries probably, the Electric Vehicle Association of America is unique. Nowhere is competition more spirited than in the automobile industry and its various allied lines of business. Yet in this association 325 manufacturers of electric vehicles, storage batteries, accessories and so forth, and a goodly proportion of "central stations" where electric current is made, are co-operating with enthusiasm to the one end of extending the use of battery-propelled motor cars.



W. H. Blood, Jr., President of the Electric Vehicle Association of America.

Like other movements that have played a conspicuous part in the development of the uses of electricity, in the cities in particular, the Electric Vehicle Association was a conception of Arthur Williams of the New York Edison Company. Two years ago last May the association was formed at a meeting Mr. Williams had called in his office. It then had 29 members and its activity, like its memberhip, was almost wholly confined to New York City. In these two years it has multiplied itself 11 times in size, and extended its direct influence all over the United States. The headquarters are still in New York, but there is a large New England branch with headquarters in Boston; a similarly important branch in Chicago; and third and fourth branches—one in Philadelphia, and one on the Pacific Coast.

In the early days of the association carpers were very ready to suggest all manner of "concealed interest." Chiefly they questioned the connection of electric light stations with the organization, or, the disinterestedness of their connection. Yet nothing that the association has done has been so important in broadening the field of electric vehicles as securing the co-operation of the central stations. There was not enough in it for them to make it worth while to have adequate facilities for charging or changing storage batteries such as are used in automobiles. On the other hand the use of electric motor cars was restricted because of the infrequency of charging stations.

Largely through the good offices of the association these two interests have been balanced so that now the charging business is at least a self-supporting feature of the central stations, while the territory in which electric motor cars can operate has been enormously enlarged by the increase of charging facilities. This kind of mutual benefit well illustrates the function of the association and the success with which it is performed.

The other important work which faced the association in its beginnings was to correct some common misapprehensions about electric vehicles which had delayed their wider adoption as compared with gasoline cars. Unfortunately, the misapprehensions were quite natural, and had given rise to deep-seated distrust of the practicability of the electric, in the minds of business men. They are to be blamed on the salesmen of the first crude electric cars who, in their anxiety for commission and salary increases tried to create a volume of business by making the most extravagant promises.

The manufacturers of both electric trucks and pleasure cars never intended them for any but city service. For this they are, in the improved form of the present, unequalled for safety, convenience and economy; they are not yet equipped for long distance work, and cannot be until some radical improvement of the storage battery makes them so. The old time salesman of electrics, however, in his eagerness to go the gas car one better, ignored the manufacturer's policy, told the prospective purchaser that he could get all kinds of things it was impossible to put into an electric out of it, and sowed the seeds of disappointment, distrust and disfavor.



Harvey Robinson, Treasurer and Assistant Secretary of the Electric Vehicle Association of America.

The winning back of public confidence, especially when it was originally based on an undeveloped machine—as the electric was then—which at best needed some time and faith for making good—the winning back of confidence in these circumstances is about as hard a proposition as an organization of business men ever has to face.

The character of the Electric Vehicle Association and the genuine spirit of progressiveness in which it was started are told best by the results it has achieved in increasing the number of electrics in use. Such

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rapid headway did it make that between July 1, 1911, and July 1 of this year, the number of electrics in New York City alone, in daily service, jumped 45 per cent., while the increase of electrics in Boston, Chicago, Philadelphia and other large commercial centres was nearly, if not quite, as surprising. To get the full force of this statement it should be remembered that these same two years in which the association has been working cover the period of the most rapid development of gasoline cars as business utilities.

The association's latest achievement and the work it has laid out for the immediate future appeals to motor truck men as well as to motor truck users, as of very practical value. It is the standardization of certain parts of all electrics so as to simplify the power problem. In order that the same charging equipment can be used for all makes of cars the charging plug must be uniform in all cars. The association undertook a campaign to secure this uniformity and has just succeeded in bringing its efforts to a satisfactory conclusion.

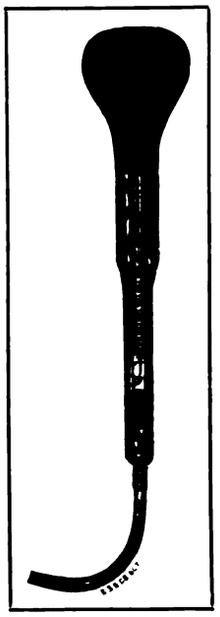
Now the association has under way studies on which may be based recommendations for the standardization of other common details of design and construction. It also has taken up the problem of economy of operation and maintenance—such as matters of power economy, tire economy and the like. The results of these investigations will be the common property of all members.

Realizing that the best method of correcting misapprehension and putting the electric into just the place it is intended to occupy is by the use of frank, unbiased advertising—"copy" which is effective to the highest degree yet is so general that it gives no particular build of electric car any advantage over any other make—the association has carried through a national publicity campaign. At the same time some of the member companies have supplemented the national advertising by doing local advertising along the same lines. A fund of $50,000 or more has been set aside already for use during the coming months, in which the advertising campaign is to be pushed harder than ever, and similar appropriations are planned for succeeding years.

In order that the problems it takes up may have most expert consideration, the association has organized itself into a group of committees which divide its field for concentrated effort. There is a committee on standardization, for example, one on insurance, one on contests, another on transportation, a fifth on rates and charging stations and a sixth on operating records.

LEAD BATTERY CARE AND MAINTENANCE.

MANY of those who contemplate the purchase of an electric pleasure car or commercial truck hesitate because of their fears that they must have considerable technical knowledge in order to properly care for the battery. They imagine that the battery requires constant attention to give satisfactory service.

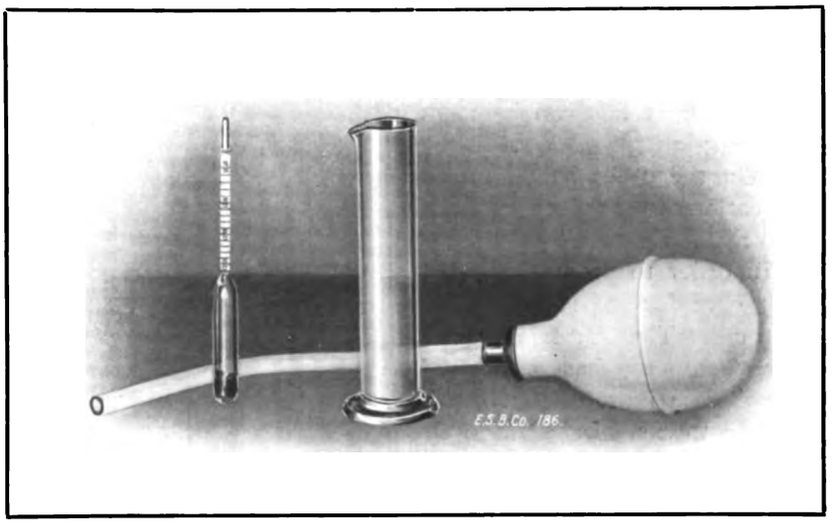


Hydrometer Syringe.

As a matter of fact no such difficulties are presented. An idea of the ease with which a battery can be operated may be had from the following instructions, which have been prepared by The Electric Storage Battery Company, manufacturer of the "Ironclad-Exide," "Exide," "Hycap-Exide" and "Thin-Exide" batteries so generally used in electric vehicle service:

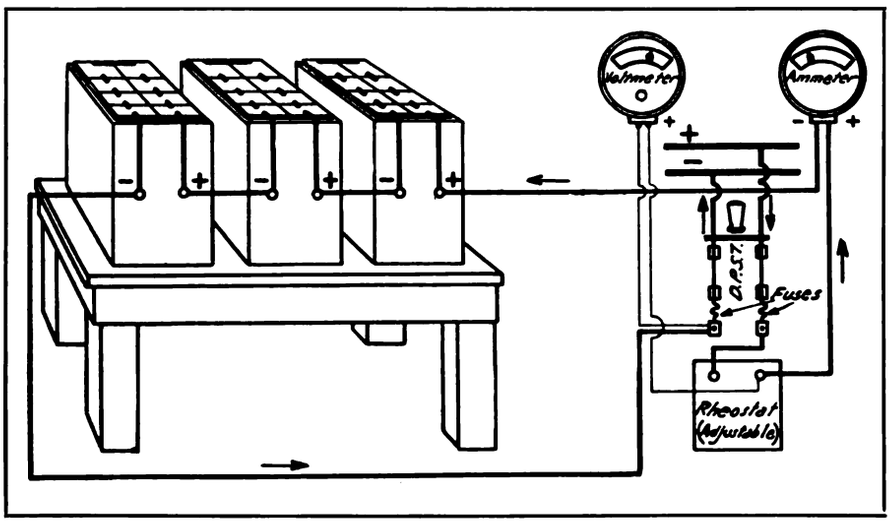
"Open the battery compartment to obtain ventilation. Commence charging at the higher normal charging rate in amperes, as stamped on the name plate of the battery, and continue at this rate until a sound of active gassing or bubbling in the cells can be plainly heard by placing the ear close to the battery. Then reduce the rate to the low rate stamped on the name plate and continue until the bubbling or gassing can again be clearly heard. This is the simplest method of determining approximately full charge and is sufficiently accurate for general operation between the periods of overcharge, as follows:

"Once every two weeks give the battery an overcharge. To do this simply continue charging after the battery has begun to gas freely at the low charging rate until four (4) successive readings of the voltmeter on the switchboard or car are the same, these readings



Electrolyte Testing Outfit, Which May Be Used Instead of the Hydrometer.

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Battery Removed from Vehicle Connected for Receiving a Charge.

being taken at intervals of one-half hour.

"At the same time that the voltmeter readings are taken, hydrometer readings of two cells in different parts of the battery should be taken. These four (4) successive hydrometer readings on each of these cells should likewise show no change. If they increase, showing a rise in the gravity, the charge should be continued until there is no further rise for two (2) successive readings.

"Note, however, that the charge must be temporarily stopped if the temperature of the battery reaches 110° F., and must not be started again until it has dropped to 100° or lower.

"The electrolyte consists of a mixture of pure sulphuric acid and pure water in such proportions as to show a nominal specific gravity of 1.280 when the battery is charged, but the battery will operate successfully between the limits of 1.250 and 1.280 when fully charged. If the specific gravity is below 1.250 it is an indication of insufficient charge rather than an insufficiency of sulphuric acid in the cell.

"Keep the level of the fluid in the cells one-half (½) inch above the top of the plates. When it falls below this point add pure water, NEVER ACID.

"Do not charge the battery if from experience with the vehicle it is known that the next trip can be made without charging.

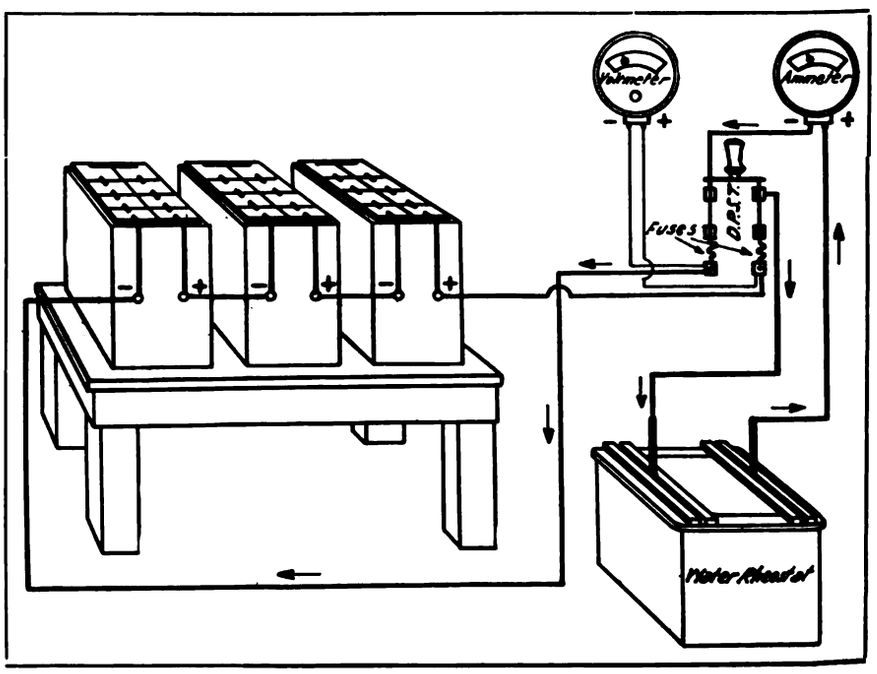
"On the other hand, never allow the battery to stand entirely or almost entirely discharged."

In order to promptly and successfully care for the requirements of its customers The Electric Storage Battery Company has established branches in most of the principal cities and towns. In addition the company employs an extensive and competent corps of inspectors who are constantly travelling about giving any assistance or information required by battery users. Between the visits of the inspectors users can get by telephone or mail advice or information on any points that may be desired.

It should inspire the confidence of the prospective purchaser to learn that thousands of those who never heard of a storage battery until purchasing an electric car are successfully operating batteries by following the brief instructions outlined above.

MOTOR TRUCK SCHOOL.

The demands for experienced motor wagon and truck drivers has been such that the West Side Y. M. C. A. of New York City has established a department for the instruction of young men for this work in connection with its automobile school. The school was inaugurated eight years ago and during its existence more than 6000 men have been enrolled as students. The work is taken up systematically and it is especially beneficial to those whose employers are changing from animal to mechanical vehicles. The course consists of shop work and lectures and practical road driving, and the school has a large truck which is driven and is demonstrated in the school work. The student has the option of taking both driving and shop work, or either of these branches, and in addition to this he is assisted to obtain a state license to drive, and often employment is obtained for the scholars, as applications are frequently received for competent men. The school was urged to train truck drivers by firms that had had difficulty in securing competent and trustworthy men. Incidentally the original school was established in cooperation with the Automobile Club of America, and its courses of mechanical and driving instruction have the approval of undoubted authorities.



Proper Connection of Battery for Making a Test Discharge of Current.

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PLAYING FAIR IN ELECTRIC TRUCK SALES.

How "Honest" Jim Smiley, an Energetic and Persistent Salesman, Interviewed a Hard-Headed Prospective Customer—A Dialogue of Possibilities.

By F. Nelson Carle.

Note: Smiley has tried for three months to reach E. Kelly Jones, directing genius of Hart & Jones, Inc., wholesale grocers. Turned down by letter, telephone and personal calls, he discards his business card and giving simply the name of "Smiley" to the boy at the gate, at last reaches the inner sanctum.

"GOOD morning, Mr. Jones."

"Good——(looking up) What do you mean by butting in here under false pretenses, Mr. Smarty? I thought you were my friend Col. Smiley or I'd never——"

"Very sorry, Mr. Jones, I had no intention of misleading you for that means a bad introduction. But now that I AM here won't you let me post you a little on what the other big men in your line are doing with our trucks? The electric as you know——"

"Electric be hanged. I wouldn't have a motor truck about the place anyway and least of all an electric. Biggest farce on earth. My brother-in-law in Spartansburg——"

"Bought two in 1903, didn't he?" eagerly put in Jim, who knew the facts, "and had a lot of trouble with them. I should think he might. The roads out in those hills are awful. But our new trucks——"

"Roads? What kind of an excuse is bad roads? Never saw one of you fellows yet that didn't crawl into some hole. People don't want excuses, they want machinery that will save money. The darn things will come into use some day, I suppose, but power trucks are too much of a gamble yet, especially anything with a battery in it. * * * Now, I've still got a stack of mail here, and the sooner I get rid of you the sooner I will get something of importance done."

As he met the level gaze of the older man, Jim's eyes began to twinkle. "Mr. Jones, how old is this suit I have on?"

"Why a month or so, I should say."

"No, sir, the coat at least is **2200 years old.** It's an evolution of the old Roman toga—an antiquated sort of a cape, as you know. * * * The motor truck isn't a new idea—it's an evolution of the old Assyrian cart. The bicycle and the touring car are only one branch of the family—not the whole tree as some people think. The motor truck got here when the world needed it, and not three days before. Look at the thousands in use! In five years big firms won't THINK of trying to get along without it. Your firm won't. If you ever get even ONE good truck working for you as it ought to work, you wouldn't sell it any more than you would scrap all your typewriters and go back to long hand."

"Very good. **Very** good. Your style of argument, Mr. Smiley, is interesting if nothing more. But," and the old warrior's face lost its bantering smile, "that last qualification of yours leaves us just where we started. **'Where can I get the truck that will run as it should?'** Now, just a minute, suppose the truck were all right in itself, who's going to keep it on the job? I'll even grant that big Jack Mullen could learn to drive anything anyone else could, but that's no insurance. It's the steady plugging I want. None of your off days in bad weather; no weekly visits to the repair shop. I want SERVICE and I want you to understand I'd buy nothing else."



"Good—What Do You Mean by Butting in Here Under False Pretenses, Mr. Smarty?"

"Mr. Jones, we have been in business ever since the truck industry started. For the last six years we have been selling **trackless transportation** and I think selling it intelligently. We have no quarrel to pick either with users of horses or with our competitors. The horses have been here a long time and some of our competitors make mighty good trucks. We claim simply this: The well built electric can be operated at a **known cost.** In its own field there is nothing which can approach it either in efficiency or economy. If you were a retail furniture man delivering goods 50 miles out I'd recommend a gas car right off the bat. But you don't go even 15 miles out and for your work our trucks are the best proposition on earth. The upkeep cost is about half what a gas truck of similar capacity would be because for your work a gas car is a round peg in a square hole. An electric on the other hand would be outclassed in the furniture man's deliveries.

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We sent back a signed contract the other day because the route to be covered by the truck was a little beyond what we cared to guarantee with our electrics. If our competitors would be equally broad minded there'd be more trucks sold, because each one working would sell another, perhaps 10. If I didn't **know absolutely** that our trucks would save you money and more money than any other machines on the market, I wouldn't be here."

"Just like the rest of 'em. Fine arguments, fine promises. Smiley, I **know** what it costs us to haul our goods with horses. I don't know and you can't prove to me what it will cost us to haul stuff with your trucks. I know you have a lot of 'em running around, but each man's business is different. Even in our line



"Bah! Electric Be Hanged! Biggest Farce on Earth!"

no two firms do things just alike. A horse is slow, but he gets there. I've had three touring cars and I know how an automobile eats up money. Me for the horse. And now for heaven's sake get out and let me work in peace."

"Mr. Jones, if you'll give me half a chance, I'll show you that you **don't** know what it costs you to truck with your present equipment. I'll show you in black and white that each pair of working horses you own costs you $1.72 per day every day in the year **for feed alone.** I'll prove to you that each double team you operate really costs you $8.16 per day, if you only pay the driver $2. (Jones begins to figure rapidly.) Then I'll prove to you that one of our 3.5-ton electrics displacing two double teams and giving you one-third more mileage can be operated for $10.35 per day, over a period of five years if necessary. There's a saving of $5.81 per day per truck and you want five trucks. That means a possible saving of $29.05 per day or for 300 days $8715 per year. That's the profit on how many cases of tomatoes?"

"Tomatoes be ———! Young man, you're pretty near right on the feed question, but where in thunder do you get your $8.16?"

"Proportionate expense," affirmed Jim. "Here's the figures." (Reading rapidly from back of envelope.) "Pro rata rent and stable expense per horse per day 27 cents; shoeing and small repairs 16 cents; harness repairs (so much), etc., etc. Depreciation for renewal of horses 21 cents per horse, per day: $8.16."

"Nonsense, we never figure all that stuff in. No one does."

"Yes, **some one** does, and the firms who really know what horses cost are the ones who get the truck fever right away. I'll gamble half of the expense out of my salary that any chartered accountant in the city will go 10 per cent. over my figures in giving you your horse costs for the last 12 months. You see I happen to know you lost three horses in the last hot spell. On the truck end of it, knowing the routes you cover, I'll get the company to give you a maintenance guarantee that three or six 3.5-ton trucks will not cost you more than an average of $10.50 per day each. That means what it says for we have enough in the old sock to back it up. Doing it every day in fact * * * Blank & Co. of Philadelphia bought two in 1907, three in 1909 and there's an order on the books now for three more to be delivered this month. S & S operate 17 and ———"

"That listens good, but tell me this: (To office boy who brings in card: No, ask him to see Jenkins.) If all the big firms you sell are saving so much money why didn't I hear of it before? The minute we put in a new elevator or build another warehouse the whole trade knows it. Your story is too good to be true, Smiley * * * Why, man, the land our stable is on is worth about $30,000. If we could do away with both stable and horses as that brewer you mentioned in your last letter did, and put up a small garage back of our No. 2 house, can't you see that we'd clean up altogether about $50,000 inside of three years?"

"Which would more than buy twice the truck equipment you need," nodded Smiley. "Wipe out the whole investment and then some. That's the wrinkle, Mr. Jones. Scientific trucking with electrics means more than selling four horses and putting in a big truck to do their work. And now I'll tell you why men in your line are not falling over themselves to buy trucks. The big firms in any line who are successfully operating good trucks are making so much money that they try to keep still about having trucks at all, unless it is in emphasizing deliveries to new customers. They're tickled to death to have others stick to horses. They're not going to give you or me figures which will show their savings with trucks. You are fortunate in one way for your competitors across the street are still

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in the same boat as you are. If ——— & Co. had some of our big moguls in place of those hired teams of theirs, you'd soon feel it, believe me. If you could save even $5000 a year with the equipment I mentioned, would you publish it?"

(Jones, squirming a little) "I guess I wouldn't, that's a fact. But what if the trucks fell down? I like the idea of no smoke or fire danger and if you'll **really guarantee** your operating costs, I'd be inclined to take the matter up with the board next week."

"That's fine, Mr. Jones, and you'll never be sorry. I ———"

"Now, don't jump at conclusions; I haven't said we would buy a shingle nail from you. We don't ———"

"I know, Mr. Jones. I have been selling trucks too long to count my chickens. I want you to feel that you can bank on what I tell you. As I said in that first letter, we've got now to where we know just what our trucks will do and we can make guarantees intelligently. They've had the kinks taken out of them in real work. You'll find that five of our trucks———"

"There you go again!" interrupting with a gesture of despair, "you ought to know we wouldn't think of selling all our horses at one crack and putting in five trucks. To get rid of you, I'll say that we **may eventually** buy one of your machines and try it out. And when I say try it out I mean it. We'll find out what's inside of it, don't worry."

"Of course you will, but not exactly as you think you will. Let me tell you that we would prefer to see you put in our machines **progressively.** Buy one now and the rest later. When you ARE ready to give us the order (grinning) I'll take care of things for you myself. When the truck comes there'll be a service man with it that big Jim (foreman) will take to right away. He'll help you break in one of the drivers and he'll stick here until you are satisfied the driver knows his business. You can garage at Downey's for a while * * * Let me make one suggestion: Don't make the truck use that narrow end of the platform where the teams will block it in. Give it a chance to load and unload just as fast as possible. Later you can save a lot of money by moving that platform any way and incidentally having that yard repaved. But there, you'll be looking for a gun in another minute * * * (reaching out hand) Good morning, Mr. Jones. Thanks awfully for the time I've taken; I know some day you'll say it was a good investment."

(Curtain.)

CALIFORNIA OWNERS ORGANIZE.

Los Angeles Men Follow Example of Those in New York and the East.

A movement to unite all owners of business automobiles has resulted in a new organization at Los Angeles, Cal., formed at the rooms of the Automobile Club of Southern California and known as the Motor Truck Club. The association is along similar lines to that in New York City and other eastern cities which have brought truck owners and dealers together for mutual benefit. Recently the Commercial Truck Harbor Highway Association was organized at Los Angeles to promote the interest of a commercial truck highway between that city and the harbor and since then matters of more general interest to truck men have developed, lending impetus to the latest organization, which will attempt to solve the many vexing problems presented.

There are now more than 1000 commercial cars in Los Angeles and according to W. F. Wood, temporary president of the new club, the city has shown a greater increase in the number of motor trucks used than any other in the country, not excepting New York City, and the commercial uses of automobiles are wider than in any other section. Therefore, a club of owners, it is held, would be particularly beneficial to



"No; Ask Him to See Jenkins!"

its members and a general invitation has been issued to such owners urging them to affiliate with the new organization. The directors are: David L. Whitford, J. B. Livezey, M. H. Council, Leo L. Kelly and George B. Harrison.

Southington Pleased with Knox—One of the finest pieces of motor fire fighting apparatus thus far seen in Connecticut has been placed in operation at Southington, where it was delivered by the Knox Automobile Company, Springfield, Mass. The truck is a model M 3 motor driven combination. It is equipped with a four-cylinder motor, with 5.5-inch bore and stroke is rated at 50 horsepower. The frame is especially constructed for fire department service, being made from channel steel, with front bumper of the same material so attached as virtually to make the entire frame one solid piece. The car is guaranteed to attain a speed of 40 miles an hour and before being placed in service it was demonstrated in the cities of Meriden and Wallingford, Conn.

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CHARGING THE EDISON STORAGE BATTERY.

By Harold H. Smith.

THE charging of the Edison nickel-iron-alkaline storage battery is one of the simplest items in the work of the battery man because of the very important fact that a battery of this type, if properly cared for in other respects, cannot be injured by electric current, providing only that, in habitual practise, excessive heating be not permitted. This is a sweeping statement and it means that in accidental or special instances this battery may be charged at high rates or at low rates, it may be overcharged indefinitely or undercharged, it may be short circuited or charged with polarity reversed without more serious result, if any at all, than a delay incident to correcting the error and charging properly.

It is perhaps because of this immunity from permanent injury, due to error or negligence, that careless habits are apt to creep in upon the battery man in the garage.

The charging characteristics of the Edison battery are different from those of other types and the same criteria cannot be depended upon. It is hoped that herein may be given such data as will indicate what shall be done in various circumstances.

The normal charge has been more or less arbitrarily chosen as one of seven hours at the rate appropriate to the size of the cell. This length of charge yields neither the maximum output nor the maximum efficiency, but has been deemed to strike the best balance between these opposing factors. The greatest possible output will be obtained after a 10 or 12-hour charge, and charges not exceeding four hours in length will yield an ampere-hour efficiency of not less than 95 per cent. It is thus seen that to suit different conditions of service it is entirely possible to choose lengths of charge, other than normal, that will most satisfactorily fulfill the conditions. It must be remembered in this connection that time-element undercharging or overcharging cannot in any way injure the battery, though, of course, useless overcharging is inimical to good efficiency and will make more frequent watering of cells necessary.

The normal charge need only be given, of course, when the battery has been completely discharged. If after a partial discharge, full capacity is required, it would be a useless waste of energy to recharge for the full normal period, and in such case the length of charge should be in the same ratio to a full charge as was the previous discharge to a complete discharge. For example, a battery which is normally charged for seven hours is discharged to the extent of only one-quarter of its normal output; a charge of one hour and 45 minutes, or one quarter of seven hours, will bring it up to a fully charged condition. This rule applies to all proportions.

Since the inconvenience of specific gravity readings is obviated in the Edison battery, except after eight or nine months to determine if a solution renewal is necessary, the question of how to know the amount of the previous discharge naturally presents itself to one who has become accustomed to depend on hydrometer readings for this information. There are, however, other methods more simple and as dependable for all practical purposes. The ratio of the mileage covered to that possible, in the case of automobiles, has been found to serve as a most satisfactory and readily accessible basis for partial charging. The length of time the battery has been discharged also serves as an indication when the average length of discharge under similar conditions is known.

The best method is that employing an ampere-hour meter. If the meter be provided with a differential shunt, the operator need have no further care than to see that the battery is charged at normal rate until the meter pointer has returned to zero. If there be no differential shunt the pointer must be advanced before the charging is begun and the charging then continued until it has returned to zero. In either case the meter should be set to recharge 25 per cent. in excess of discharge.

If there be no means whatever of knowing the extent of the previous discharge, charging by voltage may be resorted to with very satisfactory results. As the battery nears a state of complete charge the voltage rises rapidly and finally reaches a maximum which it will maintain indefinitely as long as charging is continued. This maximum under ordinary temperature conditions will lie between 1.80 and 1.85 volts per cell with normal current flowing. When the voltage has remained constant at somewhere near these values for at least half an hour it may be safely assumed that the battery is charged. If the surrounding air temperature is very low the maximum value will be higher, and if the temperature is high the maximum voltage will be lower, so that actual values should not be too rigidly insisted upon. It may easily be recognized, by means of successive voltmeter readings, when the maximum has been reached, by its constancy.

In the foregoing discussion charges at constant normal rate only have been dealt with, and wherever possible they should be employed. Such charges, however, require frequent attention to keep the current up, for since the difference of potential of the battery increases as the charge proceeds, the current will decrease unless the rheostat be readjusted from time to time. Such attention is not always practicable, in which case the current should be set considerably above normal and allowed to taper off as it will. The proper initial current value is such that the average during seven hours will be equal to the normal rate. This value depends upon the relation between the line voltage and the number of cells in series. A good tapering charge will result if 1.67 volts per cell be impressed across

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the battery without any resistance in series. In this instance the initial current will be found to be almost double normal. In charging a 60-cell battery on a 110-volt line, sufficient resistance should be placed in series to give an initial current of about 1.5 times normal.

Except toward the end of such a tapering charge, charging should not be done at less than normal rate, for a temporary sluggishness during the discharge immediately following will result. This will not be the case when discharging is done at less than about the 15-hour rate, when a lower charge rate may be used if desired, but this condition will seldom obtain in automobile practise.

While overcharging as a general practise is to be deplored for reasons of economy and convenience to the user, as already pointed out, there are times when a charge of 12 hours will be found desirable. This is the case always when an exceptionally high output is required regardless of efficiency. Further, a battery is not at its best when new, but continues to improve in efficiency for a considerable time after being put into service. It has been found that overcharges tend to hasten this improvement so that when a battery is ready for use it is well to make its first charge 12 hours long and to repeat the overcharge at the end of the first month and again at the end of the second month. After that overcharges need not be given except that it is always advantageous to give one long charge immediately after renewing the solution. On the average this will not be more than once in eight or nine months.

Under certain conditions of service "boosting" or charging at high rates for short periods is found to be almost a necessity. For example, the daily mileage of a truck may be very materially augmented if its battery be "boosted" during the noon hour, normally a period of useless idleness. As a common practise "boosting" is permissible with the Edison battery for, due to its construction, the active material cannot be thrown down as sediment. Excessive heating is not advisable, but the temperature may be allowed to get as high as 115 degrees Fahr., or even higher in infrequent instances without deleterious effect. In general five-minute boosts at five times normal rate to one-hour boosts at double normal rate will be found to yield satisfactory results. Current consumed in this way will be returned on discharge at practically 100 per cent. ampere-hour efficiency.

It may now be appreciated that the great flexibility of this unique battery in the matter of charging is a point decidedly in its favor and that its qualities are such as to relieve the owner, who must depend upon his garage force, of much needless anxiety.

Seagrave Ladder Truck—The Seagrave Company, Columbus, O., has delivered a motor ladder truck to the fire department of Columbus, O., the officials of which believe the increased protection will ultimately result in decreasing the insurance rates of the city.

SUCCESS WITH GARFORDS.

New York Concern Will Replace 40 to 50 Horses with Six Five-Ton Cars.

The Watson Contracting Company, New York City, is one of the large concerns doing an extensive trucking business that uses Garford trucks made by the Garford Company, Elyria, O., to transport heavy loads. This company has received numerous repeat orders from firms which have experimented with its product and the New York company is one of the latest to give testimonial to the worth of the trucks. For some time the concern has operated two two-ton Garford machines and they proved so successful that six five-ton vehicles were ordered recently. In writing to the Garford company, President Thomas B. Watson said:

"In accepting your proposition to furnish us with six more five-ton Garford dump trucks, for which you will find signed contract herewith, we desire to express our complete satisfaction with the two Garford trucks that we have had in use for the last six months. Each one has replaced from five to six teams. Their operation has been constant and dependable, so that we are now fully warranted in putting in a complete motor truck equipment. The service and inspection has been thoroughly satisfactory and we can only speak in the highest terms of the treatment received from your company. We propose to sell 40 to 50 horses as soon as the motors are delivered, therefore please push this order through as quickly as possible."

PEERLESS IN EXPRESS SERVICE.

Replaces Ten Horses, but Increases Business so That Horses Are Soon Back at Work Again.

A peculiar result followed the introduction of motor trucks at Newark, N. J., by the United States Express Company. Although unforeseen, it was important in affording ample opportunity of comparison. The company installed a Peerless three-ton truck, made by the Peerless Motor Car Company, Cleveland, O., which at once replaced 10 horses, the latter being sent to the company's stables at Jersey City, N. J.

But the truck had scarcely begun to operate when the improved service over an expanded territory gave such an impetus to the business that it increased to such proportions it became necessary to put the horses at work again, one team at a time. This will be continued until there are enough horses again in use to warrant replacing them with another motor truck.

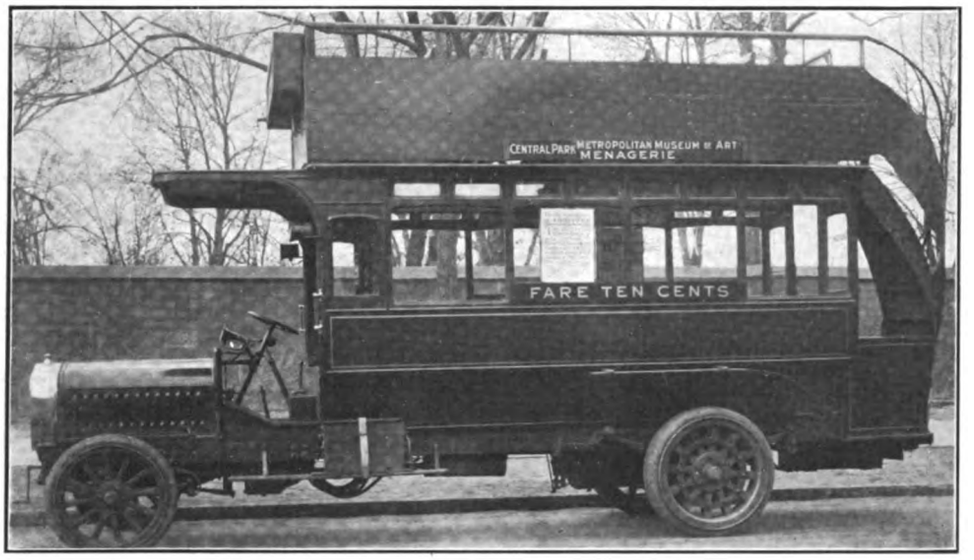
Some idea of the work done by the Peerless can be gleaned from the statement that during 25 days it carried 470,051 pounds, ran 945 miles and made 1363 stops. This is a daily average of 18,802 pounds, 33.8 miles and 54 stops.

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NEW GASOLINE-ELECTRIC OMNIBUS.

By Daniel S. Carpenter.

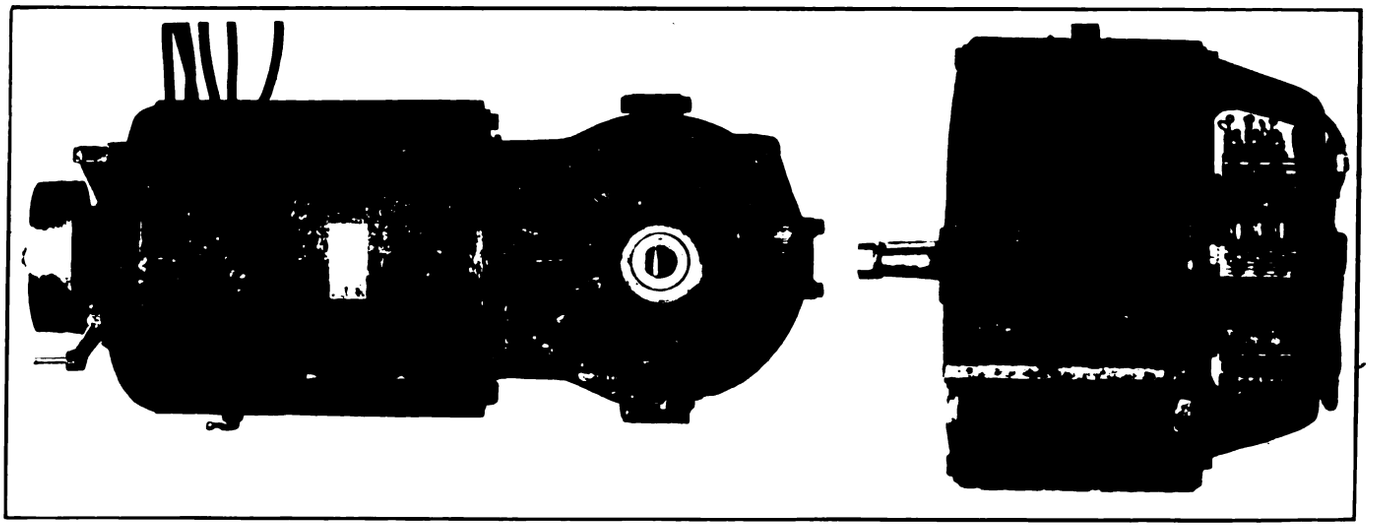
FOR over three years gasoline-electric omnibuses have been in regular operation on Fifth avenue, New York City, and have demonstrated that they meet the requirements of this service perfectly. The General Electric Company, Schenectady, N. Y., has built the electrical equipments for these vehicles, and within a few months has delivered one for the equipment of omnibus No. 15, changing this over from mechanical to electric one motor drive. The advantages of the electric drive are simple and easy control, relatively low cost of maintenance, reduction of wear and tear of transmission and engine, smooth acceleration and quietness of operation. As 'bus No. 15 represents the latest development in this line of 'buses, a brief description of it will be of interest.



Gasoline-Electric Passenger Omnibus Used in Fifth Avenue Service in New York City, Equipped with a General Electric Company's Generator and Motor.

The chassis or running gear of the new gaso-electric omnibus is designed and made especially for this service after a careful study of the requirements.

The running frame is of double armored wood with pressed steel cross members, all hot riveted with stout gussets and corners. The sub-frame for the engine and generator has three points of suspension, which arrangement relieves the motive unit from undue twists and strains. Transmission from the motor countershafts to the driving wheels is by the regular De Dion drive to the rear axle, an electric automobile motor being substituted for the gear box. Long half springs support the omnibus at front and rear in an effective manner, resulting in easy riding. Steering and driving wheels are of artillery design, 34 and 40-inch diameter, respectively. The tire equipment consists of four-inch single solid motor tires for the steering wheels, and 3.5-inch twin tires of the same kind for the driving wheels. The front axle is a steel forging, the steering wheels being mounted on pivots of the inverted Elliot type. An axle of the built-up type of construction is used at the rear. This consists of a large steel tube with heavy walls, on each end of which is securely fastened a steel casting, forming not only anchorage for the main driving wheel brakes, but a support for the axle arm stubs. All wheels run on conical roller bearings. The chassis has a wheelbase of 168 inches, with front and rear wheel gauges of 67.5 inches and 72.5 inches respectively. There are two independent sets of brakes of liberal dimensions. A foot pedal



Type GE—1027 125-Volt 60-Ampere 1300 Revolutions Per Minute Automobile Motor.

Type TD—6—7.5 Form C 125-Volt 60-Ampere 900 Revolutions Per Minute Generator.

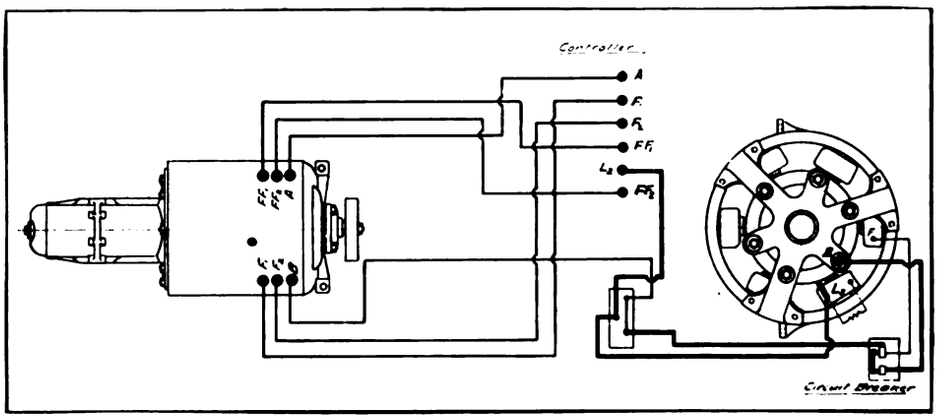
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operates the motor brake, while a hand emergency lever actuates two large internal brakes on the driving wheels. Steering is effected in the usual manner by means of a hand wheel operating through gear and sector.

The gasoline engine which is used to drive the generator is of De Dion make and is of the four-cycle type with four cylinders.

The generator is a six-pole machine, each pole being slotted on the entering side, forming a small auxiliary pole about which most of the series turns are wound. By saturation of this tip, series excitation is limited, and a drooping characteristic is the result. A further effect of this saturation is to give good commutation at times when the field is otherwise weak. Several series turns entirely encircle the pole, the shunt winding being placed over all. Here is, in effect, a commutating pole generator, with high overload characteristics and fine commutation at all loads, which is quickly self-exciting, and at the same time is of light weight. This machine is known as the TD-6-7.5 kilowatt generator, and is rated at 125 volts, 60 amperes, at 900 revolutions per minute. It may be run at 100 per cent. overload for two hours with 70 degrees C. rise of temperature, and at 50 per cent. overload continuously. It has an efficiency of 85 per cent. at normal load and weighs about 500 pounds. When in operation it has been short circuited without stalling the engine, taking 285 amperes at two volts.

On trial tests the first gasoelectric omnibus chassis, with a load of 6500 pounds, was run up grades of 12 to 15 per cent. without stalling.



Wiring Diagram of the Gasoline-Electric Omnibus, Equipped with Single Motor Drive.

WHERE ELECTRICS "LUNCH" IN NEW YORK.

By A. H. Miller.

In the early days of the electric vehicle, before either the mechanism or the batteries had reached their present high point of development, it frequently happened that sufficient mileage was not available on one charging of the batteries to carry a car to the end of its route. In those days batteries fully charged only held enough juice to carry the vehicle for about 20 miles. So it was that a demand arose for charging stations at various points throughout the city where the batteries could be "boosted" and thus make it possible for a car to be driven to its destination.

The New York Edison Company came to the rescue and in the early part of 1907 established the first station where electrics might charge. It at once became apparent that the company's various sub-stations about the city would make ideal charging stations for electric vehicles and two years after the first one was opened the number was increased to 22, including every sub-station in the city.

All of these "lunching" places are equipped with a two-outlet charging board so that two machines may be charged at the same time. Every year the company issues an eight-page booklet giving the location of the various charging stations which it maintains, as well as the names and locations of all other charging stations in Manhattan, the Bronx, Brooklyn and 30 odd suburbs of New York with the distance of each reckoned from Columbus Circle. It also includes a table of distances in New York City and vicinity, a map of Manhattan Island, and a road map of New York and suburban territory showing the location of electric auto charging stations not including those in New York and Brooklyn. This booklet is attractively arranged by the advertising bureau and mailed to all users of electrics in New York.

Although with the improved types of batteries and cars there is no such need for the local charging stations as there used to be, still their convenience is often proven. Particularly in the winter time are they of value when a car meeting with the adversities peculiar to the season needs a slight boost to carry it to its destination. Or perhaps when the batteries have fallen short of their early efficiency after a long period of use there will generally be enough juice to carry the vehicle to a nearby charging station where "refreshments" can be secured. Then, as frequently happens, a car is taken out without forethought as to the amount of juice that will be required to carry it through the day's work, but a convenient charging station saves it the disgrace of being towed in. These are only a few of the instances when the charging stations are indispensable.

Trucks for Signal Corps—Pennsylvania national guardsmen are experimenting with the motor truck in the transportation of military supplies and it has been found that for "flying columns" requiring rapid movements in the open country, the gasoline propelled forage wagon eclipses the time honored lumbering vehicle drawn by the army mule team. The proposal to equip the signal corps with motor driven instrument wagons has been advocated by several officers.

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CORRECT CHARGING OF LEAD STORAGE BATTERIES.

By James M. Skinner, Engineer of the Philadelphia Storage Battery Company.

THE whole proposition of correct lead storage battery charging may be summed up in the one rule—"Get enough current into the battery and get it in with a minimum of gassing." There is no doubt that the general observance of this rule, particularly the latter part, would increase the average life of lead batteries 20 per cent. or more, but this fact does not seem to be generally appreciated. Fig. 1 shows a case where the gain was about 30 per cent. The task of this paper will be to briefly discuss the dangers of undercharging and of overgassing, and to describe a practical charging method whereby these may be avoided and the battery life greatly increased.

A lead vehicle battery consists briefly of positive and negative plates, separators, sulphuric acid and hard rubber containing jars. The positive plates consist of supporting and current conducting grids, and active material in the form of red-brown lead peroxide. The negative plates consist of similar grids and a peculiar grayish amorphous form of metallic lead known as sponge lead. It may appear at first sight that it is a rather difficult problem to keep both of these elements in good condition with the same charging treatment, because, apparently, treatments which are beneficial to the positive are harmful to the negative, and vice versa. But a closer examination will prove that it is a perfectly simple and easy matter to so adjust conditions as to keep both positives and negatives in perfect shape.

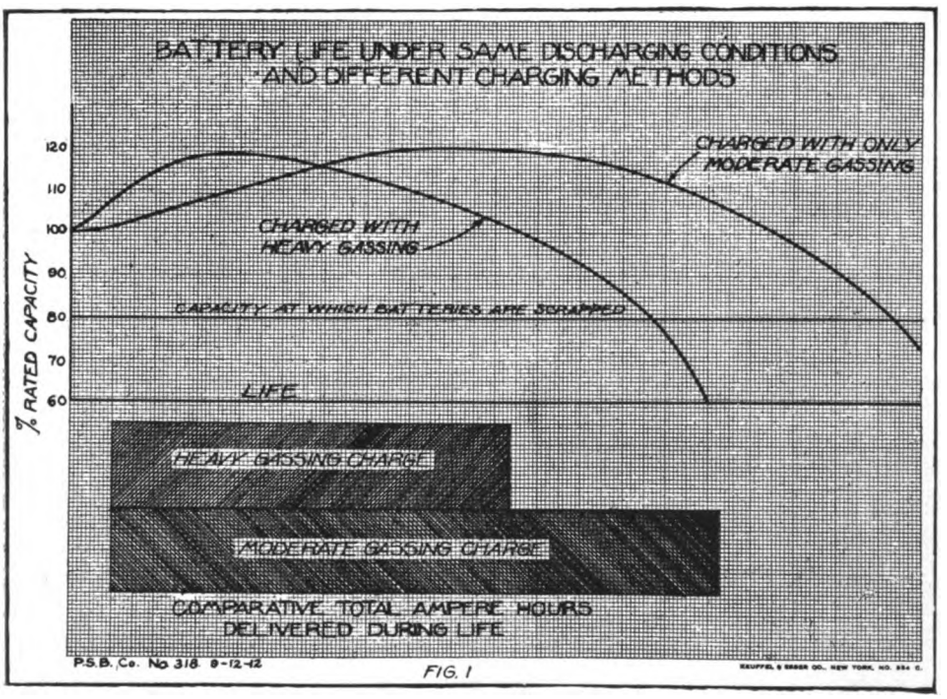


FIG. 1

Improper Charging.

Much of the improper charging which batteries receive today is harmful, not because the wrong thing is done, but because it is done at the wrong time and in the wrong way. Overcharging and undercharging are good or they are bad, depending only upon when and how they are applied. The first essential toward the betterment of conditions is a thorough understanding of the effects of each, so that they may be used with proper discrimination.

Consider undercharging first. Undercharging to a moderate extent is not detrimental to a battery, and if mixed with proper overcharging is highly beneficial. Details on this point will be given later. On the other hand persistent undercharging with too few overcharges will result in a great deal of trouble. It is very seldom that something can be got for nothing, and no battery will deliver more power than has been previously supplied to it. If the charges are unduly shortened the capacity will fall off and the battery will develop sulphated plates, the cost of current for remedying which will far exceed the saving on the curtailed daily charges.

Troubles from undercharging manifest themselves chiefly in the negative plates. When in good condition charged negative plates have a soft, velvety texture, easily indented by the finger nail. This appearance is characteristic of sponge lead. As the battery discharges the plates absorb sulphuric acid from the electrolyte, and part of the lead sponge changes to lead sulphate. Lead sulphate is hard. Consequently a discharged plate feels harder than a charged one. When the battery is recharged the acid comes out of the plates again and the material resumes its velvety texture. If an insufficient amount of current is supplied to the battery some of the hard lead sulphate is not changed back to sponge, but remains in the plate when the charge is stopped. If undercharging is persisted in an additional small amount of sulphate is left each day and the quantity at the end of several weeks or a month will be considerable. The sulphate particles are very small when first formed. If allowed to remain in the plate they steadily grow larger, since the solubility of the lead sulphate in the acid is sufficient to permit of their slow, but continual solution and redeposition, during which process the smaller particles, whose solubility is greater because of their greater surface per unit weight, dissolve more quickly and redeposit on the slower dissolving, larger particles, causing these to continually increase in size. The larger the particles the harder it is to reduce them back to lead sponge. Sometimes they grow so large as to be entirely unreduceable except by special and time-consuming

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methods. As long as it remains in the plates this accumulation of lead sulphate subtracts just that much lead from the active material, and by clogging the pores with a non-conductor, adds just that much obstruction to the passage of the current to the material in good condition. Moreover, being possessed of little cohesion, it is likely to fall from the plate, and perhaps carry with it or loosen some good active material. It should be perfectly evident from this how undercharging, if persisted in, will do great harm to the negative plates. There is sometimes a pressing need of a Society for the Prevention of Cruelty to Batteries, to intervene in behalf of batteries which are being starved to death.

It seems, however, that troubles due to undercharging are on the wane. Battery owners are becoming more and more familiar with battery requirements and are disposed to supply current in far more generous proportions than formerly. Moreover the general change in the last few years from thick to thin plates has reduced the amount of charge current necessary. The old thick plate batteries with their smaller capacity are necessarily more completely discharged on a given run than the higher capacity thin plate batteries. The thick plates are very deeply sulphated, and the inner portions of this sulphate are not easily reached by the charging current. Either much current will be wasted in gassing or sulphate will be left in the depths of the plate after each charge. The evil effect of the latter condition on the negatives has already been discussed; the effect of the gassing on the positives will follow. Thin plate batteries are not as completely discharged, the sulphate is necessarily nearer the plate surfaces and easily accessible to the reducing action of the current, and due to the larger number of plates, there is about 50 per cent. more plate area on which the current may act. Thin plate batteries therefore require less charging current than the old thick plate type.

Turning now to overcharging—every battery needs some overcharging to keep it in good condition. But care must be taken how these overcharges are given. They are not in ordinary service needed every day, and they should not be carried out at a high current rate because of the gassing which accompanies them. Gassing is the greatest factor in wearing out a positive plate. Eliminate or reduce it and the life of the positives shows an incredible increase. As batteries are usually charged, gassing occurs, not only during overcharges, but at the end of ordinary charges. The passage of the charging current tends to decompose the electrolyte into hydrogen and oxygen. In fact these substances in the nascent form do travel toward the electrodes, hydrogen with the current toward the negatives, and oxygen in the opposite direction toward the positives. Lead sulphate has the property of absorbing them as they are driven against it. During the early stages of the charge there is an abundance of lead sulphate in the plates and the hydrogen and oxygen react with it as follows:

Positive Plate.

$PbSO^4 + O + H^2O = H^2SO^4 + PbO^2$

Lead Sulphate + Oxygen + Water = Sulphuric acid + Lead Peroxide.

Negative Plate.

$PbSO^4 + H^2 = H^2SO^4 + Pb$

Lead Sulphate + Hydrogen = Sulphuric acid + Sponge Lead

As the charge continues the amount of sulphate grows less and less. If the current rate is maintained at its original value, the same quantities of hydrogen and oxygen are generated per minute, but with a decreasing amount of sulphate, it becomes more and more difficult for them to find material on which to act, until finally the rate of absorption falls below the rate of production. In this case some hydrogen and oxygen pass over into the gaseous form, and force their way through the active material into the electrolyte. The longer the charge continues the greater the proportion of the current used in generating gas.

The hydrogen bubbling out through the negative plate pores is not particularly dangerous. It may dislodge or blister a little material, but sponge lead possesses a high degree of coherence, and is further protected by the flat face of the wood separator pressing against it. It requires pretty hard and continuous gassing to harm a negative by overcharging. On the other hand the lead peroxide of the positives is not so

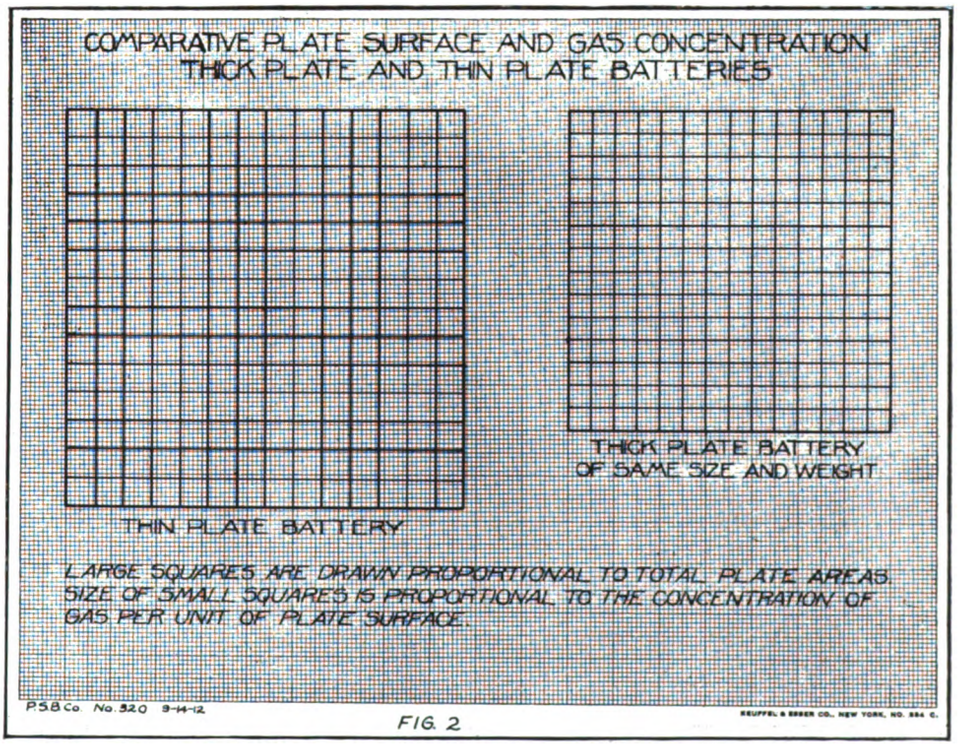


FIG. 2

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blessed. It possesses comparatively little coherence of its own and heavy gassing is apt to destroy that put in by the battery manufacturer. The face of the active material is constantly washed off, falling to the bottom of the cells as mud, and the whole mass is opened up and softened. In very extreme cases the peroxide becomes of the consistency of mush, and of just about as much coherence. Thus the life of a positive plate is directly dependent upon the amount of gassing, and the importance of a systematic charging procedure which will minimize this can hardly be overestimated. The general adoption of thin plates has been a step in the right direction, because as previously mentioned they possess over 50 per cent. more plate area than the thick plate batteries, and have therefore 50 per cent. more surface over which the gas can escape. The plates are subjected therefore to only two-thirds of the thick plate gassing wear. Fig. 2 illustrates this point.

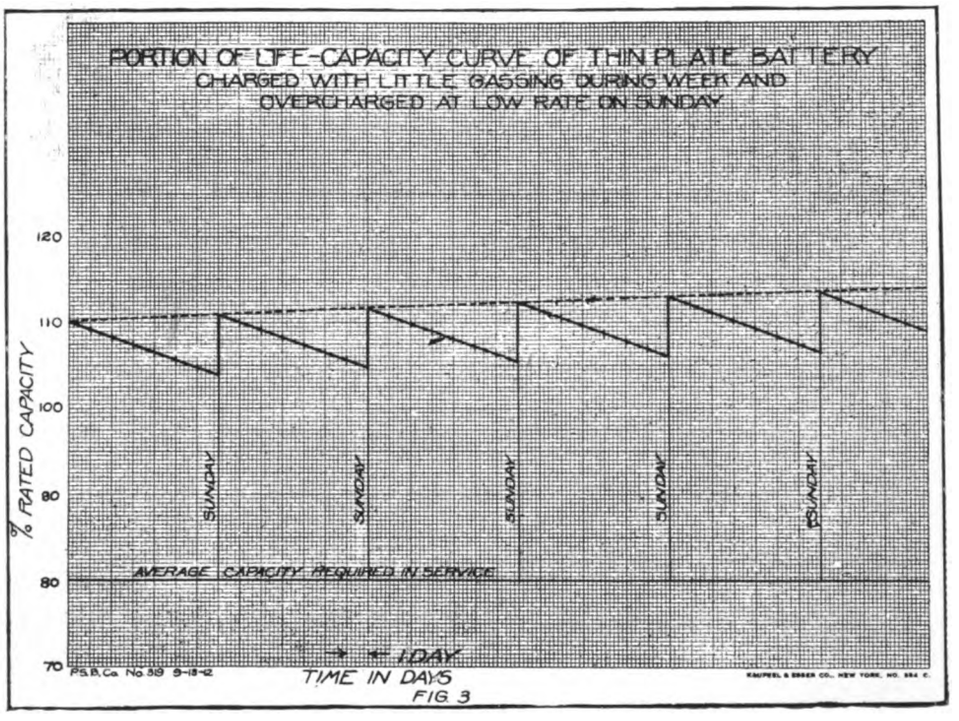


FIG. 3

To recapitulate a moment, a battery contains two very dissimilar elements; positive plates, harmed by overcharging, and demanding a minimum of current for long life, and negative plates, suffering from undercharge and requiring plenty of current for good service. As one of the large vehicle companies very aptly puts it, "the positives are injured by overfeeding and indigestion, while the negatives suffer from starvation and exhaustion."

Evidently a combination of moderate undercharging on most charges, with a special care toward keeping the current below the gassing point at all times, and occasional overcharging at a very low current rate, so as to again minimize gassing, will meet the requirements of both. In actual practise the procedure has given remarkable results. A more detailed account follows:

1. The ordinary daily charge is started at a moderately high current rate, not over the normal six-hour discharge rate, and the current is maintained at this point until toward the end of the charge gassing commences. The rate is then lowered below the gassing point, and the charge continued until the evolution of gas again commences. Here the rate is once more reduced. Tapering the current so as to keep it always below the gassing point is continued until a very low figure, about 1-10 of the normal six-hour discharge rate, is reached. At this point the charge is usually stopped, although there is no danger in continuing this low rate for a few hours more. After a very long and thorough discharge it may indeed be a good thing. As suggested by Mr. H. M. Martin in his excellent communication on the same subject, published in the Electrical World, Vol. 59, No. 24, an ampere-hour meter may be used to advantage in connection with this charging method, since a few experiments will determine points on the scale at which the current should be reduced to certain values. As to the total charge ampere-hours necessary, 105 per cent. of the discharge will usually be sufficient, although this figure should be varied somewhat according to the character of the previous discharge. For a very short discharge it may be necessary to put back only 100 per cent. of the ampere-hours taken out, for an ordinary discharge, 105 per cent. is about right, while for a very long and thorough discharge 110 per cent. may be necessary. Such details as this are easily worked out when a given set of conditions is at hand. If an ampere-hour meter is not in use, it is possible to determine the voltages at which gassing commences with various current rates, and to reduce the current to the next lower figure as the battery voltage rises to each of these predetermined points. Temperature and age of the battery have, of course, a slight effect on these voltage figures. Better still, the battery may be watched, and the proper reductions of current made when gassing begins.

2. Once a week (usually over Sunday) the battery is given a regular charge as outlined above, and then the low rate current continued until the voltage and specific gravity readings have risen to a maximum, and have remained there for some hours. Detailed instructions on such overcharging are given in all battery instruction books.

The weekly overcharge is a very essential part of the method and must not be omitted. The six-day undercharging leaves in the plates a very appreciable amount of sulphate, and this must be removed once a week. Two weeks' accumulation will be harder to remove than one week's, and that of a month may be

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very troublesome indeed. It is useless to carry out part one of the method unless part two is also employed.

Fig. 3 illustrates the capacity variation of a thin plate battery when charged in this manner. Each daily undercharge reduces the capacity somewhat, but it rises again to its full value immediately following the Sunday overcharge. It will be noted that ordinary service requires only about 80 per cent. of the full battery capacity, and that at no time does the decrease, due to the undercharge, bring the capacity dangerously close to that required. In fact a rather wide margin is always left for bad weather and extraordinary trips. With thick plate batteries, the full capacity of which is required in each day's service, it is somewhat harder to apply the method. It should not be thought that the method is an experiment. It has been tried very thoroughly in actual service, and always with remarkable increases in battery life. The number of converts to it is increasing every day, and we have yet to hear of any one's abandoning it after once putting it into effect. Try it yourself.

CENSUS FIGURES SHOW ENORMOUS GROWTH.

IT MUST be admitted that the detailed report of the 13th census of the United States, insofar as it concerns the automobile industry, hardly sets forth the present status of the commercial vehicle end of the industry. The figures were compiled in 1909 and the growth in the manufacture of business automobiles has been quite as rapid, if not more so, than during the five years covered by the report.

However, the figures are of interest, particularly as they set forth that the increase in the entire industry was 729.7 per cent. in value of products, and 528.4 per cent. in average number of wage earners employed. This places it at the head of the list, its nearest competitor having an increase of 357 per cent. in value of products and 297.3 in number of wage earners.

Even the director of census is forced to remark: "The growth of the automobile industry has been phenomenal." In 1899 the general statistics for the industry were included with those for carriage and wagon manufacture, and only 3897 automobiles were reported. In 1904 the total number, including automobiles made by concerns classified under other industries, was 22,830, while in 1909 the number was 127,287, or nearly 33 times that reported in 1899.

COMPARATIVE PRODUCTION OF AUTOMOBILES IN 1904 AND 1909.

	Gasoline		Electric		Steam		Totals	
	No.	Value	No.	Value	No.	Value	No.	Value
Buggies—								
1904	*	*	*	*	....	....	*	*
1909	4,314	$2,039,129	268	$352,121	....	....	4,582	$2,391,250
Runabouts—								
1904	10,999	7,976,821	455	453,304	677	$401,379	12,131	8,831,504
1909	35,347	27,116,901	496	648,630	361	264,948	36,204	28,030,479
Touring Cars—								
1904	6,444	10,576,023	39	55,038	737	1,150,460	7,220	11,781,521
1909	73,883	109,844,295	243	387,526	1988	3,171,367	76,114	113,403,188
Closed Cars—								
1904	*	*	*	*	....	....	*	*
1909	3,290	8,762,768	1915	3,966,536	....	....	5,205	12,729,304
Omnibuses, Etc.—								
1904	1,061	1,311,253	717	747,810	152	132,199	1,930	2,191,262
1909	799	1,767,139	409	674,015	25	43,926	1,233	2,485,080
Total Passenger Vehicles—								
1904	18,504	19,300,654	1211	1,819,595	1566	1,684,038	21,281	22,804,287
1909	117,633	149,530,232	3331	6,028,828	2374	3,480,241	123,338	159,039,301
Delivery Wagons—								
1904	140	215,897	109	235,560	2	4,000	251	455,457
1909	1,645	1,474,063	217	444,793	....	....	1,862	1,918,856
Trucks—								
1904	55	50,390	105	441,100	....	....	160	491,490
1909	1,090	2,384,703	276	780,809	....	....	1,366	3,165,512
All Others—								
1904	....	....	....	....	....	....	....	....
1909	25	140,655	2	5,000	....	....	27	145,655
Total Business Vehicles—								
1904	195	266,287	214	676,660	2	4,000	411	946,947
1909	2,760	3,999,421	495	1,230,602	....	....	3,255	5,230,023
Total Automobiles—								
1904	18,699	19,566,941	1425	2,496,255	1568	1,688,038	21,692	23,751,234
1909	120,393	153,529,653	3826	7,259,430	2374	3,480,241	126,593	164,269,324

*Not reported separately.

The value of all products of the industry proper was $249,202,075 in 1909 and $30,033,536 in 1904. Gasoline machines formed 95.1 per cent. of the total number made in 1909 and 86.2 per cent. in 1904. Of the total number manufactured in 1909, 3226 or 2.5 per cent. were rated at 50 horsepower or more; 51,218, or 40.5 per cent., at from 30 to 49; 35,257, or 27.8 per cent., from 20 to 29; 29,353, or 23.2 per cent., from 10 to 19, and 7539, or 6 per cent., at less than 10. Passenger vehicles constituted 97.4 per cent. of the total number and business vehicles, 2.6 per cent.

Two large passenger pay-as-you-enter 'buses, made by the Lauth-Juergens Motor Car Company, Fremont, O., have been put in service between Duluth and Proctor, Minn., and Bryan and Defiance, O.

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ELECTRIC MOTOR CAR MART FOR NEW YORK.

By Arthur Williams.

A GOOD deal of interest has been roused by the proposition now under consideration to establish an electric motor vehicle mart in New York City. The suggestion is a novel one in that what is intended is not a group of offices of electric manufacturers who have been persuaded to take quarters in a single building, but a co-operative showroom, so to speak—a number of huge showrooms, in fact, in which vehicles of different makes are exhibited side by side, without discrimination for or against.

This idea was promulgated at the meeting of people interested in the electric car which was held Sept. 5 for the organization of the New York Electric Vehicle Association. The purpose of the association is to bring together in common interest manufacturers and owners of electric motor vehicles, makers of storage batteries, of electric motor car equipment, and of electrical current in New York City. The new organization will not interfere with the national electric vehicle association, but locally, anyway, will do some things which the national body hardly undertakes.

Besides the establishment of an electric vehicle mart, it is proposed to do some wholly novel work. For instance, the efficiency and economy of the storage battery, its reliability and convenience are to be made understood. So many contradictory things have been said about the storage battery, and so many announcements of new types of it have turned out to be premature, that the public mind is more or less confused, and is accustomed to think of the storage battery as something that would be great if it only could be depended upon. The degree of perfection that has been attained is not at all realized, and the New York Electric Vehicle Association purposes bringing the facts home so that this neglected power agency will come into its own.

One of the association's ideas which indicates a line of progress that must be followed by more and more businesses in the future, it would seem, is the establishment of facilities for keeping storage battery equipment always in the best of working order, regardless of the usual selfish consideration of who made it. The plan is to employ experts who do not represent any particular company or individuals, but are at the service of the entire electric car industry and of any owner of an electric.

In other ways also the manufacturers will be brought into closer co-operation for advancing the general interests of electric automobiles.

The used car problem will be given serious consideration for one thing. It is intended that the proposed electric vehicle mart—for which a satisfactory location is already being sought—shall be of service to this end. The charging question, which made so many difficulties for electrics in the earlier days, will be helped toward solution by compiling and publishing in some form, for the use of owners, a list of charging garages which possess the proper electrical facilities.

Arthur Williams of the New York Edison Company, who is the prime mover in the new organization, presented a suggestion which will doubtless be adopted with enthusiasm, the more so because it provides for taking care of a need which every owner or operator of any kind of an automobile has long felt: the need of accurate, thoroughly reliable information as to roads, routes, garages and charging stations in the vicinity of New York City.

While the New York Electric Vehicle Association will welcome members from any part of the country, its executive management will be controlled, not to say confined, in New York City. There will be a permanent salaried secretary whose services will always be at the command of any member. What the organizers of the association emphasized most strongly at their first meeting was the principle of not showing the least prejudice, but working all the time for a common good.

The officers of the organization are the following: President, Arthur Williams, New York Edison Company; vice president, William P. Kennedy, Baker Motor Vehicle Company; directors, E. W. Curtis, Jr., General Vehicle Company; E. W. Menefee, Anderson Electric Car Company; Nathaniel Platt, Baker Motor Vehicle Company; C. Y. Kenworthy, Rauch & Lang Carriage Company; M. G. Macdonald, R-C-H Corporation; W. R. Chandler, Flanders Manufacturing Company; George H. Phelps, Studebaker Corporation; V. A. Villar, Champion Wagon Company; John H. Kennard, Couple-Gear Freight-Wheel Company of New York; W. L. Case, Lansden Company; Charles A. Ward, Ward Motor Vehicle Company; A. B. Roeder, Fritchie Automobile and Battery Company; executive committee, Nathaniel Platt, C. Y. Kenworthy, S. W. Menefee and V. A. Villar.

The officers are now considering a proposition for permanent location in a building centrally located, of sufficient proportions to meet all of the anticipated requirements, which the owners are ready to lease on a basis that is regarded as reasonable. It is suggested that this structure, should it be chosen for the mart, shall have on the first or ground floor a garage. On the second shall be the showroom, on the third the salesrooms, and the upper floors shall be occupied by the offices of the different companies interested in the mart. It is believed that this concentration of interests should attract nearly all of those engaged in the industry or representing the different manufacturers.

The association's educational efforts will be twofold. Frequent meetings are to be held in order that the members may become better acquainted and may co-operate more closely in what is being done; and a vigorous and extensive advertising campaign will be conducted for the instruction of the public.

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THE ELECTRIC VEHICLE AND RETAILER.

By Adrian S. Stevenson.

LEARNED commissioners inform us that the small merchant, particularly the butcher, grocer, baker, have reached a crisis. We are told he is too many and makes too little; that he must progress or drop out. He in turn admits it, but knowing no way out must hang on till he is engulfed. What to do is the question. He is up against the powerful chain store system, to say nothing of the huge department stores. To increase prices is out of the question. To consolidate or combine is possible, but this requires considerable capital and few are able or have the executive ability to do it. The only other resort left is to increase business at the old stand without increasing expense. How then may this be done? One thing is certain: if the mountain won't come to Mahomet—to the mountain he must go.

Leaving the abstract and getting down to the concrete we find the small dealer the victim of a disease largely of his own making. He suffers because he confines himself to a too limited and much overworked field. The time was when horseflesh was cheap enough so that every little store could maintain a couple of nags and cover quite some distance. That day has gone. The horse is today expensive and inefficient when the limit of his radius is considered. To send a horse a mile to deliver a rush order amounting in value to 50 cents is out of it, and hence the retail butcher, baker and grocer often contents himself with customers within five or six blocks. When a customer moves a mile or two away his trade goes with him. Possibly a new family moves in to replace the old one, but the trade of the new people may go to a competitor. Knowing the disease why not remove it root and branch? The cure is certain and sure and no merchant is too small or too poor to afford it. Where there is a will there is a way.

Let us look to facts. In June, 1911, Zampieri Bros., French bakers of New York, were persuaded much against their will to invest in a 750-pound electric wagon. It was a bold step for them, but knowing the disease and its consequences they took a chance. The machine was cared for in an old wagon shed and charged from a small panel set close to the wall. In the first nine months this vehicle averaged over 1200 miles per month, making from 40 to 100 stops per day. The cost of current was 44.9 cents per day. Investigation developed the fact that this small machine produced 25 per cent. of new business on its regular route. At the end of the nine months this firm ordered a 1000-pound electric wagon to further its prosperity and three months later another of 1000-pound capacity. Located near Canal street on the East side this firm has no monopoly on trade or choice of customers. Now, however, it is simply not affected by distance or weather. The milk in the cocoanut is simply this—Zampieri Bros. are in Harlem, the Bronx or Brooklyn, or any part of New York, just as effectively as though they had branches located in those places and their overhead expense has increased but little. Their electrics give them in effect the results of a chain of stores, but without any increase in rent or plant. When customers move the electric moves along and serves them. Other cases and cures there are by the hundred, but this one just referred to was a supreme test amongst a class of people who are known to trade on small margins.



Six of the General Vehicle Delivery Wagons in the Service of the Boston Branch Grocery, Hartford, Conn., a Concern That Has Materially Increased Its Business by Special Deliveries.

The fly in the ointment at the present stage of the game is that very often the investment in a truck amounts to as much as the small dealer's investment in his store. When, however, he is brought to see that a truck is as good as a couple of branch stores, that he won't lose his customers though they move several

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miles away, and that his delivery costs decrease as his business grows, he will forget the question of first cost and look into the situation as he should. What has been said about the small retailer applies equally well to the larger and more powerful dealers.

In October, 1910, the Boston Branch Grocery in Hartford, Conn., purchased its first 1000-pound electric wagon. In July, 1911, it purchased four more and at present has four more in order to be delivered in September and October, 1912, making nine in all. This firm's boast is that it delivers anywhere, any time in any weather, and it does. The firm has a class of trade that uses the telephone, and during the horse era it was necessary to restrict deliveries to certain times of the day on fixed routes. If, therefore, an order came after the regular wagon had started it was held till the next trip. Now, however, orders are filled regardless of time or distance. This doesn't mean that system is not used, it means the system is flexible enough to



General Vehicle Delivery Wagon Used by Zampieri Brothers, New York City, Baker, to Expand Its Business.

catch all the business there is and what is most important, at a profit.

The largest contributing factor to the success of the electric vehicle in retail delivery service is its extreme simplicity of operation and maintenance. This combined with its long life and reliability make it the ideal power wagon for the retail trade.

Gramm Proves More Efficient—H. A. Winheim recently purchased a three-ton Gramm truck, made by the Gramm Motor Truck Company, Lima, O., which he has adapted to use on his truck farm near St. Louis, Mo. The daily haul is 20 miles and formerly several two-horse teams had to work a full day to accomplish the round trip. The truck performs the task in much less time, getting the produce to market in fresher condition and proving more efficient in every particular. The total cost of upkeep and operation has been far less than that of the horses and wagons formerly in service.

"HOT WEATHERISMS."

General Vehicle Company Uses Temperature Changes as Argument for Its Product.

"Hot Weatherisms" is the title of a booklet issued by the General Vehicle Company, Long Island City, N. Y., that is devoted to statements concerning the efficiency of the electric wagon during hot weather. It deals with the lessened efficiency of horse haulage during the days when the temperature is excessive and points out that the electric is not only equally as efficient, but by the use of spare batteries it can be worked 24 hours a day, a reserve utility that is especially desirable for those whose service is increased largely with the heat.

It is also maintained that when the demand is increased three or four times the need is most urgent for the profits are certain of realization, and that no delivery that has not a large reserve can be depended upon to obtain the fullest benefit of the emergency business.

WOULD BOND DRIVERS.

Motor Truck Club of New York City Finds the Problem of Interest.

At a recent meeting of the Motor Truck Club, New York, it was agreed that about 75 per cent. of the success or failure attending the use of a motor truck depends upon the driver. That the driver of a commercial motor vehicle is a very important factor is pretty well understood, but that three-quarters of its success depends upon him was somewhat of a remarkable statement.

The discussion covered all phases of the problem of truck drivers, and methods of securing the best service. Instruction in best routes rather than shortest ones was deemed necessary to efficiency and the question of bonding drivers was taken up, the only advantage in this being apparently that of securing a better type of driver as only those of good character are supposed to be able to secure bonds.

It was shown that in one installation of 40 trucks a saving of 41 per cent. in operating and maintenance had been effected by arranging three classes for the drivers, each differing by $2 a week in salary and grading the drivers according to a set maximum limit for each class on the cost of running and keeping up their vehicles.

Federal Meets with Success—During one week the Federal Motor Truck Company, Detroit, maker of the Federal trucks, received orders for 295 trucks from Martin L. Pulcher. When the Federal truck companies now in course of organization at St. Louis and Kansas City are completed, 200 more trucks will be added to the week's list. The company has had a rush of orders and is preparing for an output for 1913 of 1500 trucks, which number may be increased to 2500.

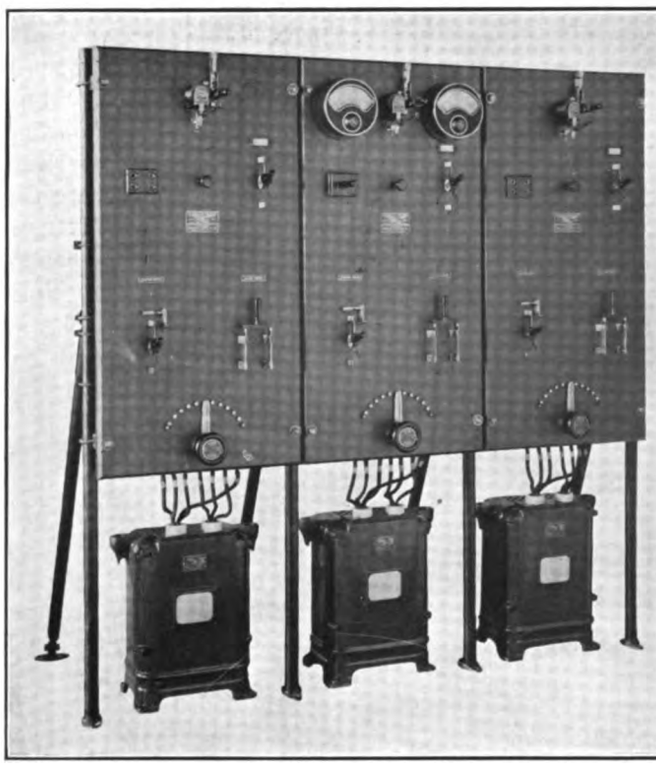
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STORAGE BATTERY CHARGING PANELS.

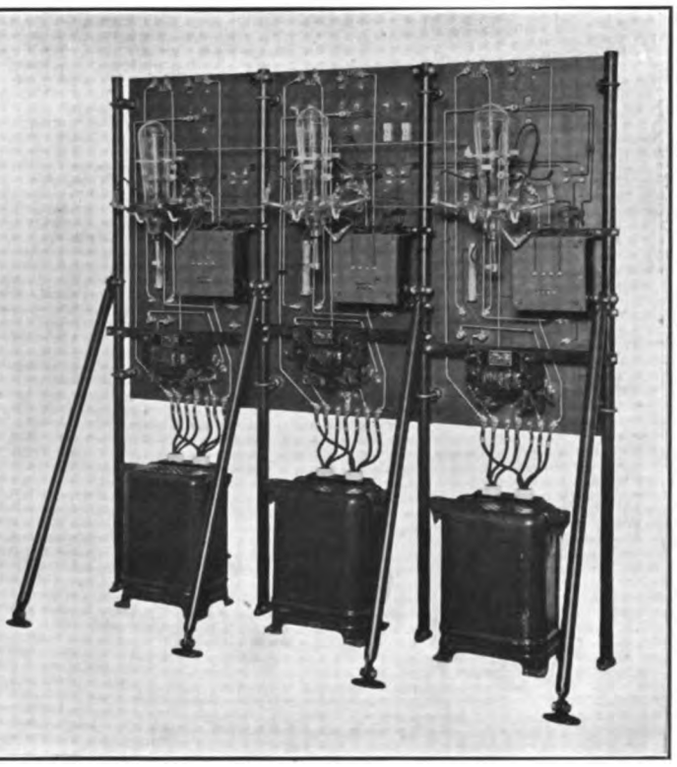
By Daniel S. Carpenter.

INVESTMENT in charging apparatus proportional to the business done is one of the many advantages to be gained by installing mercury arc rectifiers in garages for battery charging. As many units as are needed to take care of the actual business being done may be installed at first and other units added as needed to take care of the increase in business. By installing rectifier panels the garage owner is not compelled to make a heavy investment in a large charging set to take care of the increased business which he expects to have at some future date, and which set, for the present, must operate at a reduced efficiency due to being only partially loaded.

In the average public garage the batteries to be charged may vary from a 24-cell to a 44-cell one, rendering it exceedingly inefficient to charge them by means of multiple circuits with a rheostat in each circuit as the losses in the rheostats in the circuits with the smaller batteries would be excessive.



Front View of Commercial Vehicle Type Rectifier.



Rear View of Commercial Vehicle Type Rectifier.

Charging of Pleasure and Commercial Vehicles.

Many garages are equipped with the so-called "public garage type rectifier" which embodies a method of series-multiple charging whereby the batteries are so arranged as to get the proper equalization of charging voltage on the series groups, thus practically eliminating the loss in rheostats.

The public garage type of rectifier consists of two panels, a feeder, or distributing panel which controls the charging circuits and is so designed that the series and the series-multiple connections are made on the panel, and a rectifier panel, the rectifier having a range of voltage of from 45 to 230 volts direct current when operated from a 220-volt, 60-cycle, alternating current supply. The rectifier panel is supplied with voltmeter and ammeter for indicating the direct current output, with a circuit breaker and also with a double regulating dial switch having 17 contact buttons, six of which are connected to rough regulation and 11 to fine regulation taps on what is termed a "regulating compensator," thus permitting a wide range of alternating current voltage across the rectifier tube and consequently a wide range of voltage from the direct current side of the rectifier.

The public garage type of rectifier will charge as many as 90 cells in series, or 180 cells when connected in series-multiple, and when properly handled is undoubtedly the most efficient method of charging batteries in a garage.

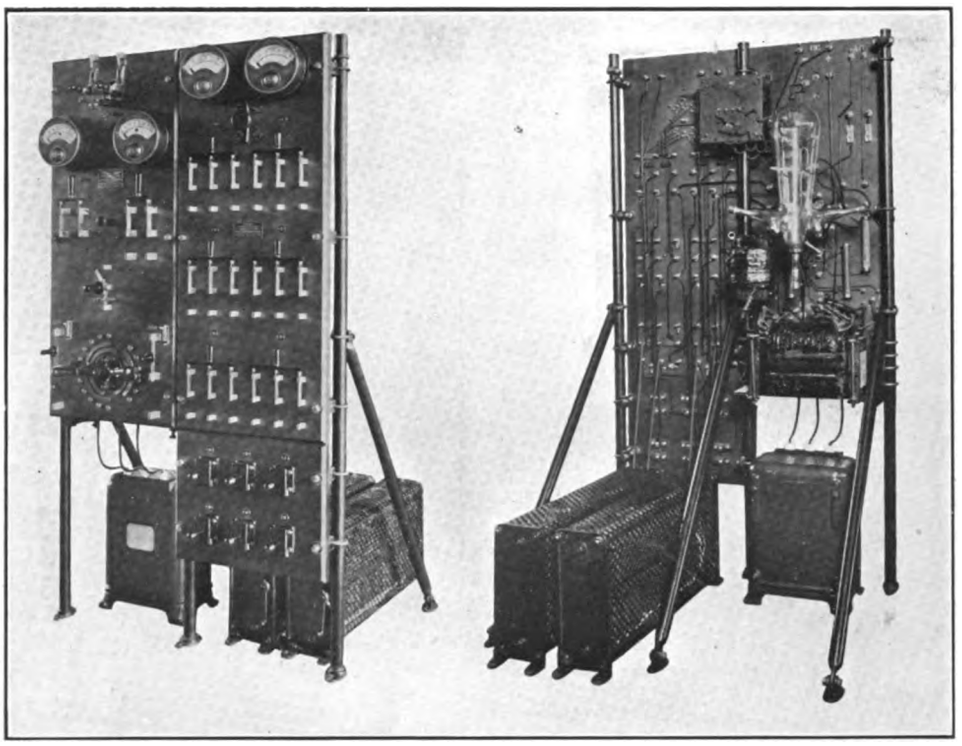
Garage Charging of Vehicles for Delivery Service.

The "commercial vehicle type rectifier" is designed particularly for installation in the garages of department stores, express companies and other concerns maintaining electric delivery service where all the batteries have approximately the same number of cells and the same ampere charging rate. It is designed for charging a 40-44 cell lead plate battery, or a 60-cell Edison battery at a 30-50 ampere rate, and is for operation on an alternating current circuit having a potential of 220 volts and a frequency of from 25 to 60 cycles.

The instrument panel is equipped with high grade

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direct current ammeter and voltmeter. On each panel there is a double pole potential receptacle, one side of which is connected to the voltmeter on a panel provided with instruments, and the other side to the direct current terminals of the rectifier panel on which the receptacle is mounted. Hence, if the voltmeter plug is inserted in any receptacle, the voltmeter will indicate the voltage on the corresponding rectifier and battery under charge from that panel. A spring switch arrangement also permits connecting the ammeter on the instrument panel in the circuit of other rectifiers wired to the switching arrangement so that a number of panels can be installed and so wired that the charging current and voltage of any panel in the group can be readily determined when only one of the panels is provided with instruments. For this reason the panel is made in two designs, with instruments and without



Front and Rear Views of a Single Phase Mercury Arc Rectifier Garage Outfit, Equipped with Sub-Base.

them. As each rectifier is a complete unit, a charging outfit may be installed, which will consist, at the outset, of a single rectifier panel with instruments, and panels without instruments may be added as the increased business makes it necessary.

The efficiency of one of these sets will be between 75 and 80 per cent. and the power factor, which will depend upon the amount of regulating reactance in circuit, will vary from 70 to 90 per cent.

These rectifiers are manufactured by the General Electric Company, Schenectady, N. Y.

Big Order for G. V. Trucks—The General Vehicle Company, Long Island City, N. Y., is now building for the Adams Express Company an order of 17 trucks, which are to be sent to different cities for regular service as soon as delivered.

MOVING BY WHITE TRUCK.

Ability to Compete with Railroads in This Field Ably Demonstrated in Connecticut.

That the motor truck is destined to supersede the railroad in the transportation of certain goods was demonstrated recently when the three-ton White truck, made by the White Company, Cleveland, O., and owned by Fred W. Wolven, engaged in the general moving and furniture business at New Haven, Conn., carried a load of furniture for Thomas O'Connor of Westville, Conn., to his new home in Arlington, N. J.

Mr. Wolven has been using the car on long haul work since its purchase a short time since, but the New Jersey trip was by far the longest he has taken and was essentially an experiment to learn the capabilities of the vehicle. The start from Westville was made at 5:30 in the morning, the chauffeur driving to New York, crossing into Jersey on the ferries, thence to Arlington, where the load was delivered and returning to the White company's service station at New York City, where he arrived at 5 in the afternoon. The return trip to New Haven was made the next morning.

The total amount of gasoline consumed was 15 gallons, and in discussing the trip Mr. Wolven said: "I had more furniture on the truck than I could have put on two of my large horse vans. I purchased the White truck a few weeks ago and I have found that it does the work of five horses and two vans. That of course cuts down the salary of one driver and also eliminates the expense of keeping the horses, while the cost of operating the automobile is very low."

Brewers' Truck at Convention—One of the Benz-Gaggenau six-ton trucks owned by Peter Doelger, New York brewer, and in charge of Bruno Kayser of the Benz-Gaggenau truck department, left New York recently for Boston, where the Boston Brewers' convention was held. Six of these trucks have been operated over a daily mileage of 60 to 100, and Mr. Doelger has contracted for six more of the Benz-Gaggenau chassis. In Boston the truck was demonstrated for the members of the brewers' convention and before returning to New York will make a tour of the New England States, which will cover a total distance of some 1200 miles.

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COST OF ELECTRIC CURRENT.

Some Interesting Figures Based on Results Obtained from Actual Experience.

Those who are not informed are inclined to believe that the cost of current necessary to charge vehicle batteries is excessive, but when the actual requirements are known it will be seen that the expense is comparatively small. It should be understood that a battery is seldom exhausted, and whatever energy remains is added to and the charge brought up to its maximum efficiency. In this connection some very interesting figures are presented which are based on actual experience and can be regarded as in every way dependable. The tables are founded on the assumption of 300 working days in the year:

Type of vehicle.	Max. Demand KWH, Full Charge.	Estimated Av. Annual Demand, KWH.	Estimated Annual Demand KWH, Maximum.
Five-ton truck	39.5	8,300	11,850
3.5-ton truck	33.0	7,200	9,900
Two-ton truck	26.3	5,500	7,890
2000-pound wagon	19.8	3,800	5,940
1000-pound wagon	16.8	3,100	5,040
750-pound wagon	13.2	2,300	3,960

Considering the cost of current to be four cents the kilowatt-hour, and taking the average demand and the maximum demand for current the cost for each type of vehicle is found to be approximately as follows:

Type of vehicle.	Average Annual Mileage.	Annual Cost.	Maximum Annual Mileage.	Annual Cost.
Five-ton truck	7,200	$332	10,500	$474.00
3.5-ton truck	8,310	288	12,000	396.00
Two-ton truck	9,390	220	13,500	315.60
2000-pound wagon	10,140	152	13,500	237.60
1000-pound wagon	10,500	124	13,500	221.60
750-pound wagon	10,620	92	13,500	158.40

Taking the average mileage and the annual cost for current the following results are found:

Type of vehicle.	Average Annual Mileage.	Cost a Mile, Cents.
Five-ton truck	7,200	4.611
3.5-ton truck	8,310	3.465
Two-ton truck	9,390	2.343
2000-pound wagon	10,140	1.499
1000-pound wagon	10,500	1.184
750-pound wagon	10,620	0.886

BUFFALO COMPANY'S ACTIVITIES.

Babcock Plant to Be Devoted to the Exclusive Production of Service Vehicles.

The Buffalo Electric Vehicle Company, Buffalo, N. Y., which was formed by the consolidation of the Babcock Electric Carriage Company and the Van Wagoner Electric Vehicle Company, proposes to specialize the production of delivery wagons and service vehicles, and will give over the entire Babcock plant in West Utica street to the building of these machines. The factory is large and well equipped and it is expected that the output will be to its capacity as soon as the plans of the company have been determined.

The company has acquired a building at Main and Parker streets of large proportions, the upper floors of which will be devoted to the manufacture of pleasure cars, and the lower floor will be made a salesroom for all types of vehicles. The salesroom is large, having a frontage of 75 feet in Main street, and it is well lighted. It is now being fitted for the uses of the company.

NEW G. M. C. CATALOGUE.

Interesting Booklet Devoted to Description of Electric Models Made by This Company.

The General Motors Truck Company, Pontiac, Mich., has issued a booklet known as Catalogue No. 105, which is devoted to description, both general and specific, of the G. M. C. electric wagons and trucks. The booklet has been prepared with extreme care with a view of affording to any person interested practically all of the data that could be desired, and it covers in detail every type produced by the maker. Besides this information it considers operation and maintenance and presents some figures that are especially interesting and convincing.

The booklet is handsomely illustrated, many of the features of construction and some of the special qualities of the design being shown. As a practical volume it has much merit. The booklet has unusual value to the power salesman or representatives of the electric light and power companies, but it is good reading for any business man.

WAVERLEYS IN LIGHTING SERVICE.

Louisville Concern Equips Trouble Men with Specially Designed Electric Roadsters.

The Louisville Lighting Company, Louisville, Ky., has purchased of the Waverley Company, Indianapolis, Ind., six Waverley electric roadsters, to be used by the trouble and the repair departments. Including the four light delivery wagons of the same make the company now has 10 Waverley machines in its service.

These roadsters have been fitted for the special service for which they are required by the installation of boxes at the rear of the seats to contain the supplies and the tools ordinarily carried. The delivery wagons will carry the larger quantities of construction material required. The order for 10 machines is unusual with the lighter type of vehicles. The roadsters are the same as the machine that was driven 1400 miles in 12 days in the Indiana cars Four-States tour last year.

Baker Trucks at Worcester, Mass.—The Worcester, Mass., branch of the American Express Company has received the first of the Baker electric trucks that are to be used in that city and they are now in daily use. These are of two-ton capacity, a standard size with the company, and are similar to those in use in other cities. The machines are garaged at the garage of the Worcester Electric Light Company, in Faraday street.

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ELECTRIC VEHICLE PRACTISE.

Qualities of Electrical Transports That Make for Economy of Service and Extreme Endurance—Introductory to a Specific Consideration of Their Designing, Construction, Operation, and Maintenance.

(By William W. Scott.)

IN WHATEVER service it may be employed the electric power wagon possesses every quality that makes for economy. The long service that can be depended upon with anything like reasonable care and attention, is another factor that must impel the consideration of those who regard efficiency as equally as important as economy.

The electric motor driven wagon is intensely practical. In it the designer can compute exact power efficiency and this computed capacity can be realized in practise. By this is meant that electrical engineering units of measurement are universal and always have the same value. Any result can be established with absolute exactness. Nothing is approximated. This applies to every use of electric energy, and it will be understood that there is no variance with reference to the electric conveyance.

The electric wagon is designed and constructed to principles that have been established as mechanically correct. It is singularly free from weaknesses, and it has qualities that insure unusually long endurance. The longevity of any machine depends to a large extent upon the use made of it, but there are electric wagons in daily service in New York that have been in operation more than 12 years, and these are of types that were crude as compared with the perfected constructions of today.

The electric wagon is generally standardized. With practically every make now offered in the market the batteries and the motors are standard productions, and while the methods of utilizing the power may differ, and differ materially in some instances, the machines are built to designs that are seldom varied and will be continued for indefinite periods. Some of the best known builders have but one design and build perhaps a half dozen sizes, this being the ideal of standardization, and when vehicles are so produced it will be realized there is every reason why there should be no change.

There are limitations to the capacity of the electric wagon so far as mileage is concerned and for this reason there are works that cannot be as economically performed as with other forms of vehicles, this applying particularly to long hauls, but the range of capacity is from 35 miles with the heavy trucks to 50 miles with the light wagons on a single battery charge. By the use of spare batteries these mileages may be doubled, but battery changing is not practical in a straightaway haul, so it may be said that the radius of movement of the electric machine is an outward haul of half the battery mileage, and return. It is possible to materially increase the utility of a vehicle by giving the battery a "boost" or partial charge, and long distances have been covered by machines that have been so charged.

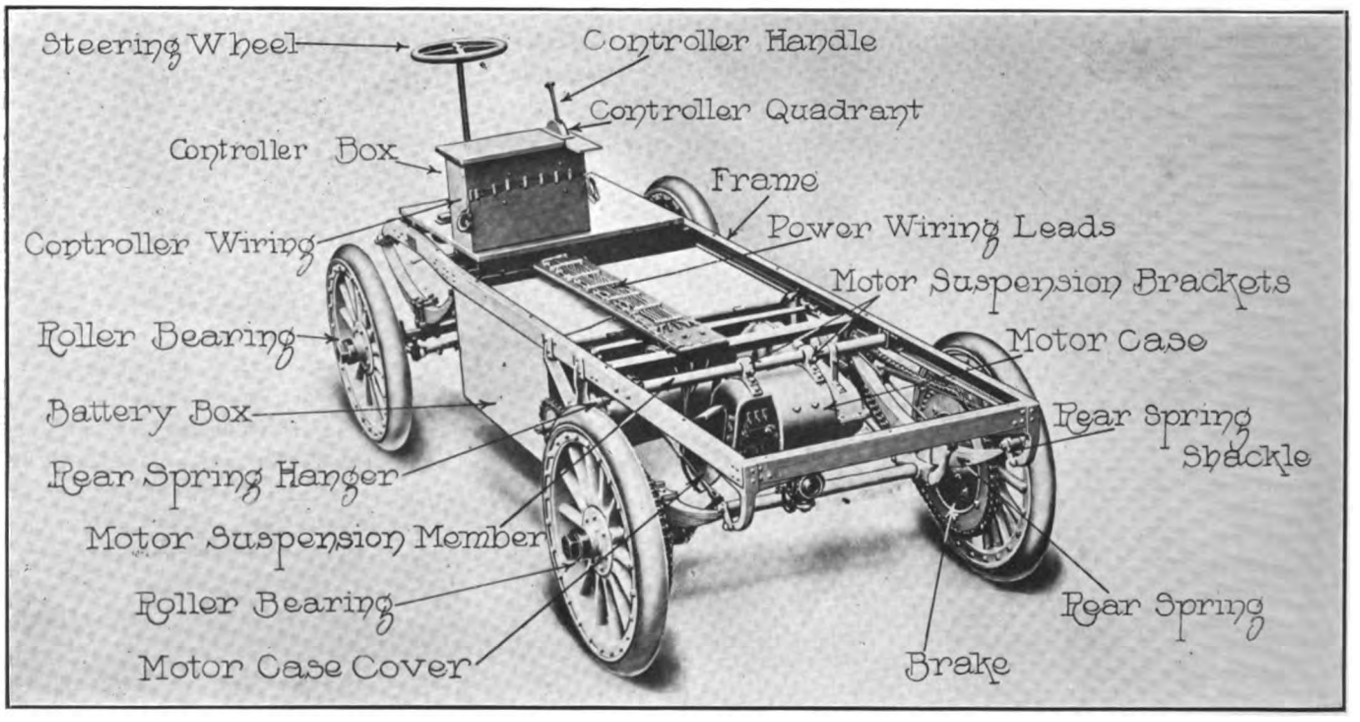


Fig. 1—A Typical Electric Wagon Chassis, Seen from the Rear, Illustrating Some of the Components.

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There is no question, however, that the capacity of storage batteries will be materially increased. During the past five years remarkable progress has been made in their development, and not only has weight been reduced, but capacity has been increased, a two-fold gain. And in addition to this the life of the batteries has been prolonged, so that it will be understood that from every point of view progression has been made. It is apparent that with these successes there is every reason to expect the battery builders will continue their endeavors to add to the efficiency ot the wagons.

As to the cost of current for charging the batteries, it may be said that the average rate for electric energy is by no means excessive. The owner who can produce current for his vehicles can no doubt lessen the expense materially, and in large installations it may be that the reduction could be as much as two-thirds of the prevailing commercial rate. Circumstances and conditions would very largely determine economy in private current production. Like every other utility, the electric vehicle is most economical when used in numbers, and the cost is usually proportionately lessened as the number is increased.

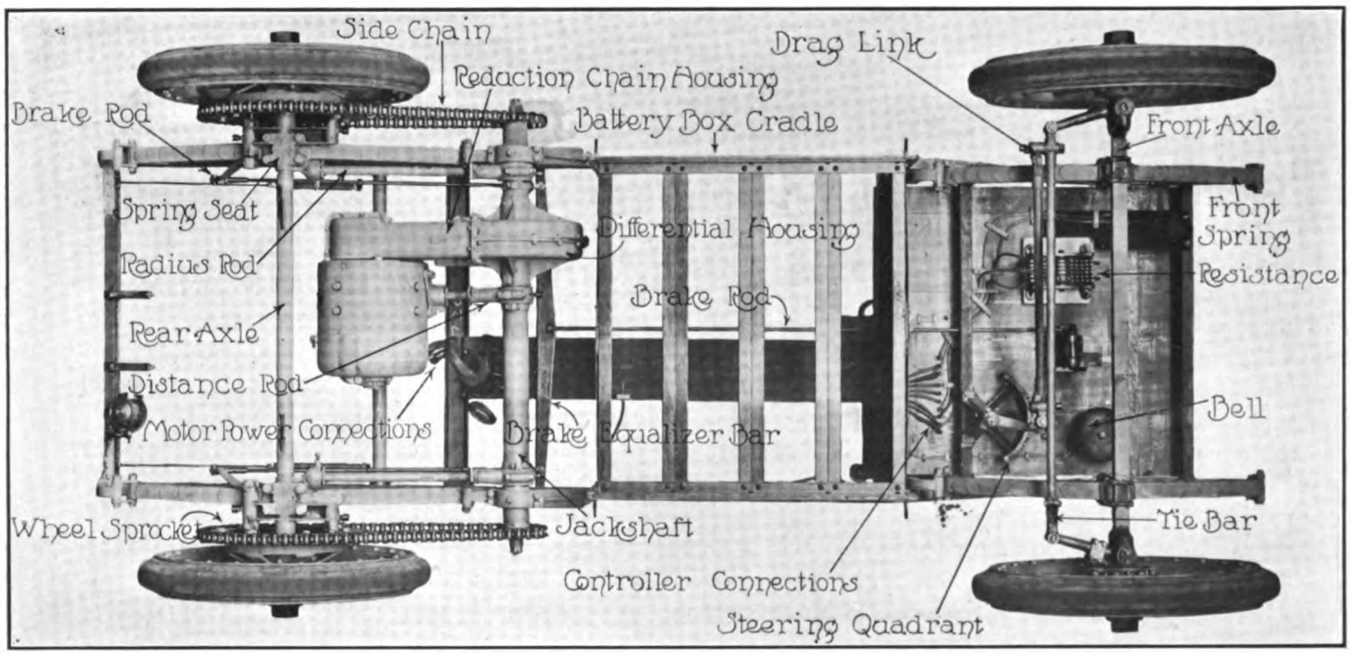


Fig. 2—Bottom View of a Standardized Electric Wagon Chassis, Showing Important Members.

Sources for Charging Service.

As the one thought of those who are considering the use of electric vehicles is the certainty of obtaining current, it may be well to point out that in the United States today are approximately 30,000 different public service corporations that produce electric energy for power and lighting. This number is constantly increasing. Each plant has a definite capacity and current is supplied to consumers in any desired volume. Usually the energy is utilized for power during the day and for lighting at night.

At certain periods of the day, especially between midnight and 7 in the morning, and Sundays and holidays, the demand for energy is considerably less than the consumption. The production cannot be gauged to demand and any excess over the actual requirements cannot be conserved. Where the power demands are large and the day production is much in excess of the night consumption, many central stations charge a smaller rate for current used between 6:30 in the evening and 6:30 in the morning. Obviously, with electric vehicles, the charging is generally done at night and at a time when the current consumption is smallest.

Practically all central stations have use for highway vehicles, and naturally a considerable number have utilized electrics. This has impelled the installation of facilities for charging and garaging the machines used. The experience with these wagons has impressed the managements of these enterprises with the commercial possibilities of all forms of electric transports, and has effectually demonstrated their utility and economy. Many central stations have begun to systematically promote the use of such vehicles, and some have established garages where every desired attention is given to owners who do not care to provide private garaging facilities. Such garages are usually conducted to carefully developed systems and without exception the service afforded is in every way high class and reasonable.

Central Station Garages.

From the viewpoint of the central station it is desirable that the owners of electric power wagons shall realize a standard efficiency, and usually attention is directed by expert electricians and high class vehicle men. There are many garages where electric vehicles are cared for and maintained, but this service is not often specialized and is usually incidental. Exclusive electric public stations are today the exception, and this condition has impelled the establishment of garages by the central stations. There is every reason to believe that in a comparatively short time the cen-

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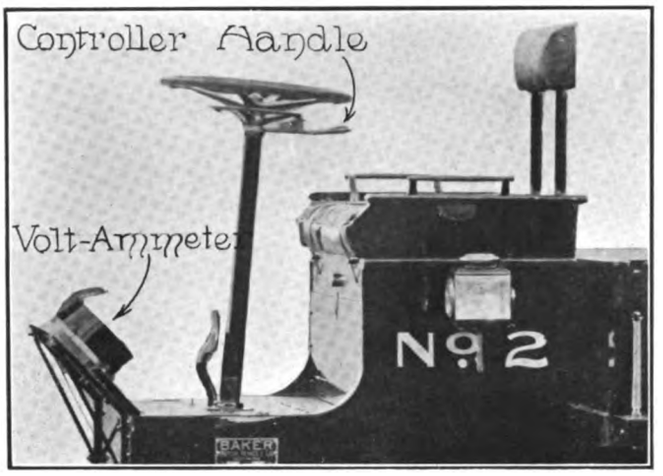


Fig. 3—The Baker Method of Steering Column Control.

tral station garage will be as much a public requirement as now is the light and power service.

It is not probable that the average owner of one or several vehicles would care to establish a garage, and incur the expense incidental to its maintenance, but would rather contract for a service that would for a reasonable price insure expert attention and a continuation of efficiency. In this way he would eliminate all possibility of neglect and place himself where he would receive the benefit of every facility and convenience of the station.

Each central station and the community it serves represent a field for electric vehicles, the demand being proportionate to the stimulation given their use and the volume of business transacted. As a business proposition the stations will no doubt be impelled to cooperate in whatever will add to their revenue, and this means not only promotion of the electric vehicle, but the establishment of such facilities as will insure a full realization of their utility.

No Mystery About the Electric Wagon.

There is nothing mysterious about the electric wagon. Aside from the chassis running gear its chief components are the motor, battery and controller. While it is true that a person considering such a vehicle may know nothing of these elements, it is also true that at every hand is abundant demonstration of the efficiency of them all. Millions of motors are in daily use and in every form of service. They are regarded as the most economical form of prime mover. No more severe or exacting work could be conceived than driving electric trains and street cars, and the world over motors of the same design as are used for electric wagons are used for railroad propulsion. Every person knows how reliable and enduring these railroad motors are. Regarded from any viewpoint the motor represents the highest mechanical efficiency. The controller of the electric wagon is also of the same type used with street and railroad cars. As both motor and controller have been developed through an experience of more than a score of years there is no reason to believe that these standard products are any the less reliable when used in wagons. At all events both motors and controllers are sufficient for railroad service.

The motors are built by the largest concerns of the kind in the world. They represent the most advanced engineering and the highest workmanship, being designed to have extreme endurance and yield the most economical service. The materials are determined with great care and there is a wide margin of safety with every component. The motors are encased and protected from every influence that might cause deterioration. The parts are interchangable for each type and can be obtained at short notice and at comparatively small expense. Being produced in large numbers the cost of the motors is relatively low. There is no probability of cessation of manufacture.

The simplicity of the motor may be puzzling to the unmechanical mind. Because the injunction of the builder is to keep it clean and oiled, and there are practically no adjustments or attention required, one not well informed may believe that only an expert can

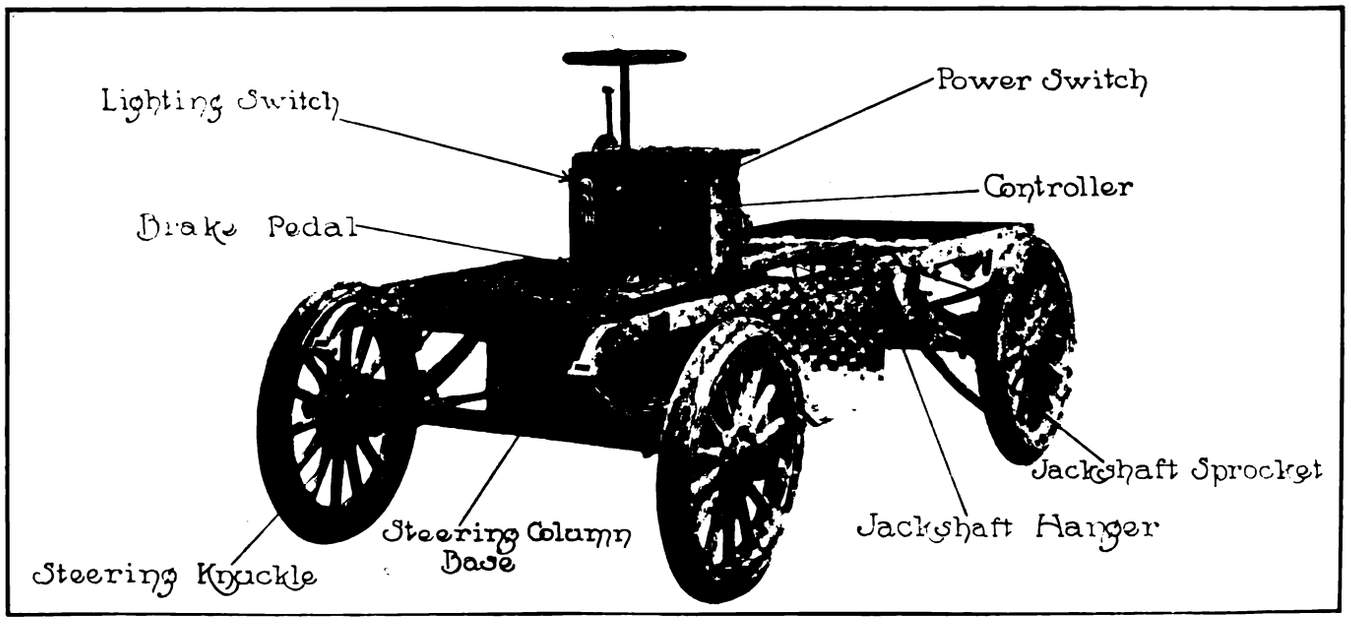


Fig. 4—Three-Quarters View of an Electric Chassis, Indicating Position of Control Members.

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operate and maintain a motor. As a matter of fact the machine is well nigh fool proof and it is constructed to run for months with lubrication and cleaning. As there are but two bearings to oil, and ordinarily the cleaning is confined to wiping the commutator with a cloth into which a little clean vaseline has been rubbed, with an occasional adjustment of the brushes, it will be understood that the real mystery of a motor is that it is so simple. If work is required this is usually of an inexpensive character.

The attention required by the controller is practically confined to cleaning, oiling and slight adjustments for wear and are correspondingly simple.

Storage or secondary batteries are constructed with extreme care and have capacities that can be determined with great exactness. They are the products of concerns that have the service of engineers of wide experience and they are built to meet the requirements of constant service. The care and maintenance of batteries is not difficult and methods that have been found productive of the best results are advised for the users. Common sense must be used in charging, discharging and maintaining them, and the advice by the maker for use can always be depended upon to yield satisfactory results.

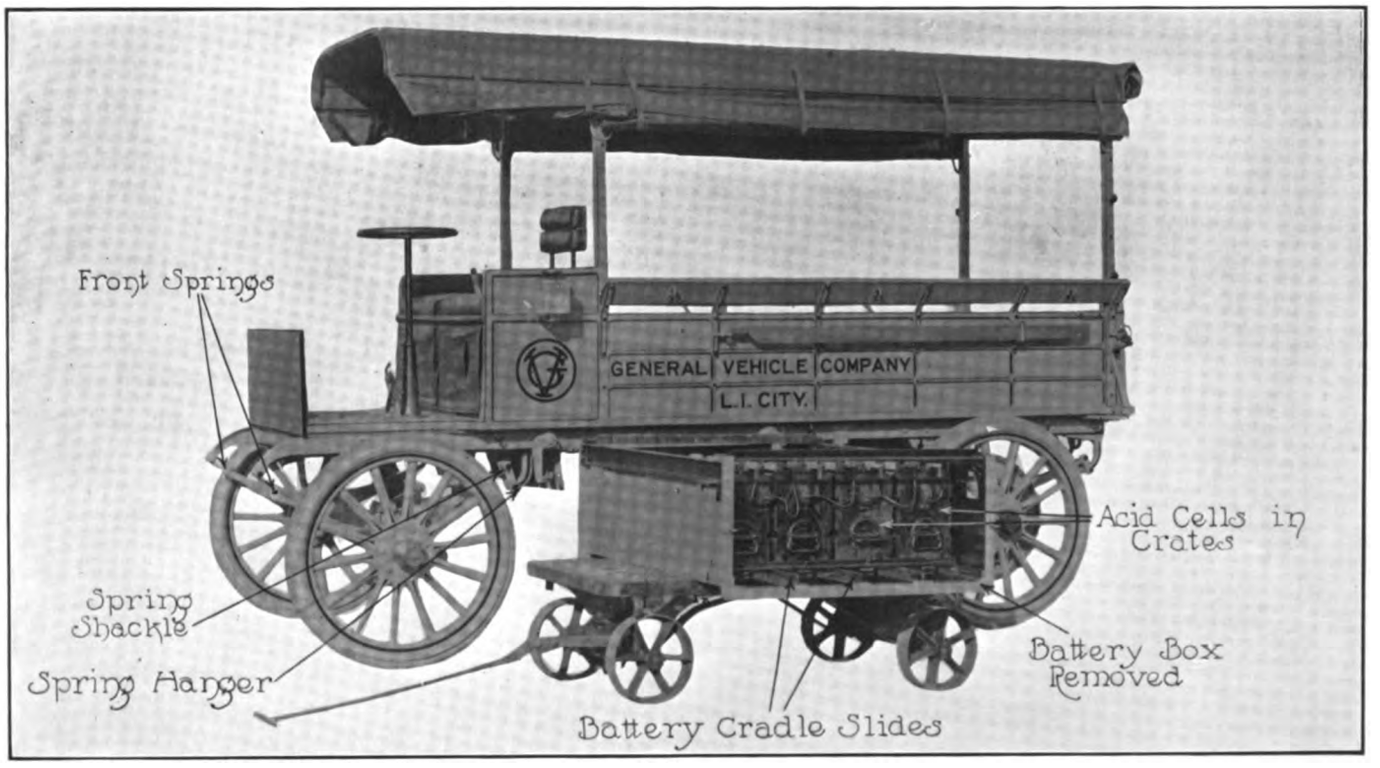


Fig. 5—Electric Wagon with Express Body, Showing Battery Crates Removed from the Cradle.

Large Reserve Power Available.

The man who is considering the electric vehicle for service should judge the capacity by the work that it can do. That is, judgment should not be based on the assumed small power of the motor. All motors have large overload capacities and they will develop temporarily from 200 to 300 per cent. more than the normal rating, but this excess power is never developed unless it is needed. This is an elasticity in which the reserve is always available. The certainty of the power of the electric wagon is abundantly demonstrated in service; especially in work where large loads are constantly carried, and trucks are built that have a capacity of seven tons, the manufacturers having no hesitancy in guaranteeing them.

Electric vehicles are limited as to speed. The limit is usually 12 miles for the light types and seven miles for the heavy trucks. They cannot be driven to extremes by careless or reckless drivers and the motors cannot be abused.

The handling of the electric wagon is simple from every standpoint. The man who has never before driven a machine can be trusted to drive after brief instruction. No mechanical knowledge is necessary, and it may be regarded as undesirable, as a man who does not know will obey orders and can be trained to give exactly the care and attention that is essential, while a man who assumes knowledge might by his ignorance, carelessness or neglect cause some damage. A man may be taken from a horse vehicle and broken in to drive in a short space of time, as his experience in road and traffic customs and rules and familiarity with the streets and roads is especially desirable. Not only this, but the man who is accustomed to horses is not inclined to drive carelessly.

Ed. Note—This is Part I of a work that will consider the electric vehicle in practise from every point of view. It will continue in succeeding numbers of MOTOR TRUCK and will be comprehensive in detail and illustration. Part II will deal with Electric Vehicle Development.

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The MOTOR TRUCK
Devoted to Motor Driven Business Vehicles of All Classes.

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ELECTRIC VEHICLE EXHIBITIONS.

The exhibitions of electric vehicles, electric vehicle and electric garage equipment, made in connection with the electrical shows held in Boston Sept. 28-Oct. 26, and in New York Oct. 9-19, have unusual interest to the business world. There are purposes for which such machines have particular qualities, and demonstrations for years have proven their practical utility within specified limitations. Electric current is supplied commercially for nearly 30,000 different commercial centres, and each central station has, or can have, such facilities as are necessary for vehicle battery charging. Besides these, thousands of concerns produce electric energy that may be utilized at comparatively small expenditure.

The scientific production of standardized components has placed at the command of electric vehicle builders absolutely dependable parts, and development work is progressing with a view of increasing capacity, insuring greater economy, and placing in the market machines that have extremely long life. Electric transports have been tested for years with surprising results as to endurance. In New York wagons and trucks now in service have been used 12 years and promise to serve for a considerable period. Used with other forms of transportation they have been equal to all expectations and have given satisfaction.

These exhibitions are intended to bring to the attention of the business world the different forms of wagons and trucks, the designs, constructions, materials, workmanship, capacities, body equipment and loading space, and the details of the motors, batteries, controllers and instruments necessary in their operation. Besides, it is intended to afford opportunity for observation of vehicles in actual use. At the Boston show a garage in the building gives a regular service to machines owned by concerns in different businesses, and demonstrates the attention and care necessary to maintain them in condition for constant use.

In practically all motor vehicle shows of the past electric machines have been subordinated by the innumerable exhibits, and the displays have been made by a few manufacturers, there being no general showing by the industry. In the exhibitions referred to nearly all makers of industrial vehicles and many pleasure car builders have representation, all displaying the latest and best of their products. The shows have been widely exploited and it is expected that the electrics will be seen by hundreds of thousands of visitors. The fact that the machines are shown in large numbers and under circumstances which will direct special attention to them should be decidedly promotive and impel investigation of the vehicles that ought to be productive of large and favorable results.

CARE OF POWER WAGON TIRES.

There appears to be every reason why a garage or public station that is giving regular service for power wagons should give careful attention to the tires of the machines. This is not a reflection upon those who conduct such stations, but it is an emphasis that with the tire expense a considerable part of the cost of operation there should be endeavor, so far as possible, to minimize this cost. The tires of service wagons are subjected to much more severe wear than are those of pleasure vehicles, largely because the roadway cannot be selected, and the shoes are often scratched, torn and cut, in which condition they are more easily worn or damaged. There is no question that with the tires cleaned each day after use, the cuts and tears closed with plastic rubber and hardened with acid or vulcanized, there would be a large gain in tire endurance and an increased service that would amply compensate for the time required to inspect and repair the shoes. The average garage of today gives its attention to everything else than tire maintenance, this being left to the driver and owner to judge and decide, as each emergency arises.

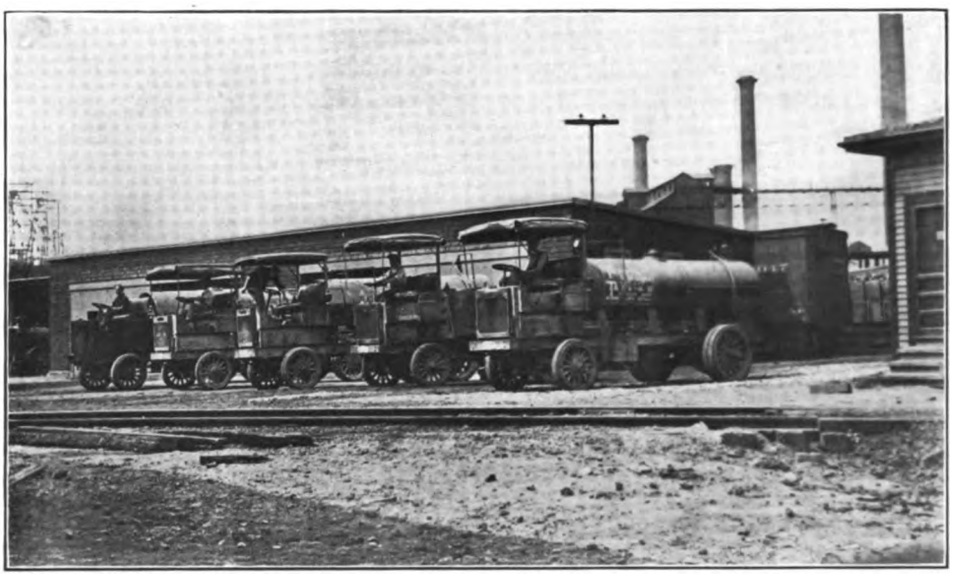
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THE MOTOR TRUCK IN ROAD BUILDING.

Tank and Spraying Installations Insure Best of Highway Work, and Economize and Increase Radius of Direct Delivery of Barrett Manufacturing Company.

EVERY man engaged in business is interested in highway improvement. He has to contribute to the cost of haulage, no matter whether or not he owns vehicles, and if he maintains his own delivery service he quickly realizes that the expense of maintenance depends largely upon the condition of the streets and roads. There are those who assume to believe that a highway, once constructed, should not deteriorate and should cost but little thereafter. There are others who understand that the improved way attracts traffic that cannot be otherwise than destructive in proportion to its volume.

While it may appear paradoxical the motor truck, which is regarded by many as being a destroyer of highways to even a greater degree than the pleasure car, would appear to be the one certain means of developing and improving the roads of the country. There are numerous reasons, but the principal one that may be cited is the suburban business that will impel the delivery from the commercial centres for considerable distances and create a demand for road improvement that cannot be denied. Pleasure car use is a matter of convenience, but business commands facilities that must be provided.



Battery of Alco Trucks, Used for the Delivery of Tar Products by the Boston Branch of the Barrett Manufacturing Company.

In Modern Road Construction.

Not only this, but the use of motor trucks in modern road building is as certain as in any other work where time and labor may be saved by improved methods. In highway construction motor trucks were used for hauling stone comparatively early in their development. Prior to this tractors and trailers were employed. There has been one factor, however, militating against the general adoption of trucks by contractors, this being the competitive bidding for work and the uncertainty that there will be continuous service during the period of the year when construction can be carried on. The average contractor must limit his capital investment and the fact that he can keep his outfit busy but half the year, the other half his equipment being unproductive, has been often prohibitive. That his vehicles would cost him but little while not worked is not regarded of as much importance as having the cash they would represent, and it is a fact that many contractors prefer to hire horses and carts rather than own them. Besides, it is urged that no contractor has any guarantee of work and it may be necessary to go considerable distances from one job to another.

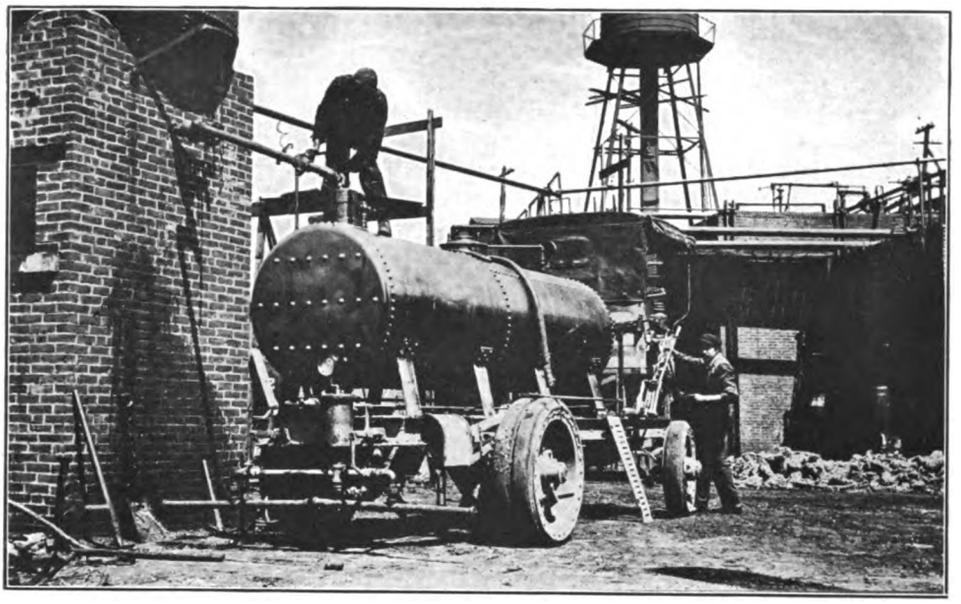
In road construction, the excavating is slow because a great deal of it is done by hand tools, and the excavated material is hauled over rough ground. The custom is to erect the crusher as advantageously as is possible, both with reference to the supply of stone and the work, and the crushed material is hauled to the place where the construction is in progress. As most modern crushers are so built that the wagons may be loaded by gravity, and the carts may be unloaded by dumping, it will be seen that the greater part of the time may be devoted to haulage and travel, which makes for economy of the time of the men.

One of the most important items of cost in truck operation in road construction is for tires, as the loose fragments of broken stone are generally sharp and are exposed, so that in driving over them constantly the surfaces of the tires are cut and scarred, especially the shoes of the traction wheels. This has been another reason why contractors have hesitated to use trucks. With other forms of tires, however, there would appear to be no reason why this expense cannot be greatly decreased.

Experience with Tarvia.

But in the haulage of the bituminous binding material that has been very generally adopted in the construction and preservation of macadam roads the truck has been utilized with unusual success. The illustra-

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Loading a Tank Truck Equipped with a Spraying Apparatus with Heated Tarvia at the Everett, Mass., Works.

tions show the manner and methods by which the Barrett Manufacturing Company distributes its tarvia products within a radius of approximately 50 miles of the works, and delivers them ready for application. This form of delivery is something decidedly out of the ordinary and it demonstrates the fact that any municipality that maintains its own streets and roads can own its equipment and do its work with a large measure of economy.

When tarvia was first produced by this company but one grade was manufactured, which was prepared at the works at Everett, Mass., in barrels and hauled to the work by wagons or carts. It was necessary to heat this in large kettles at the roadside, and it was applied with dippers or coal hods while hot. As it cooled it was covered with stone screenings and was rolled. It will be understood that this form of road treatment was economical, but a considerable part of the expense was the handling of the material, not its actual cost. There was a decided merit to the result of the application from many points of view, but later another product was manufactured, the original being designated as tarvia A and the second as tarvia B. Tarvia B was intended for use as a surface binder and dust suppressor, it being of a fluid character that eliminated heating, so that it could be applied cold to the road. It has a moderate quality of penetration, and is recommended chiefly for preservation of existing roads, and not for new construction. The third product is known as tarvia X, and is a heavier and more substantial material, being without fluidity when cold. It is necessary to heat this for application, and generally it is mixed with the crushed stone and used to bind the entire upper course instead of the surface.

The problem with the engineers of the Barrett Manufacturing Company was to economically apply these products, and for tarvia A it seemed probable that no better method than has been described could be employed without special apparatus. Tarvia B was of a consistency that made practical the use of tank wagons and hose, for it was found that with the diminution of the gravity head in the tanks the fluid could not be equally applied without means of specially directing it upon the road surface. Tarvia X could only be used when heated to a comparatively high temperature, and it was necessary to apply it with such fluidity as to insure adhesion to the stone.

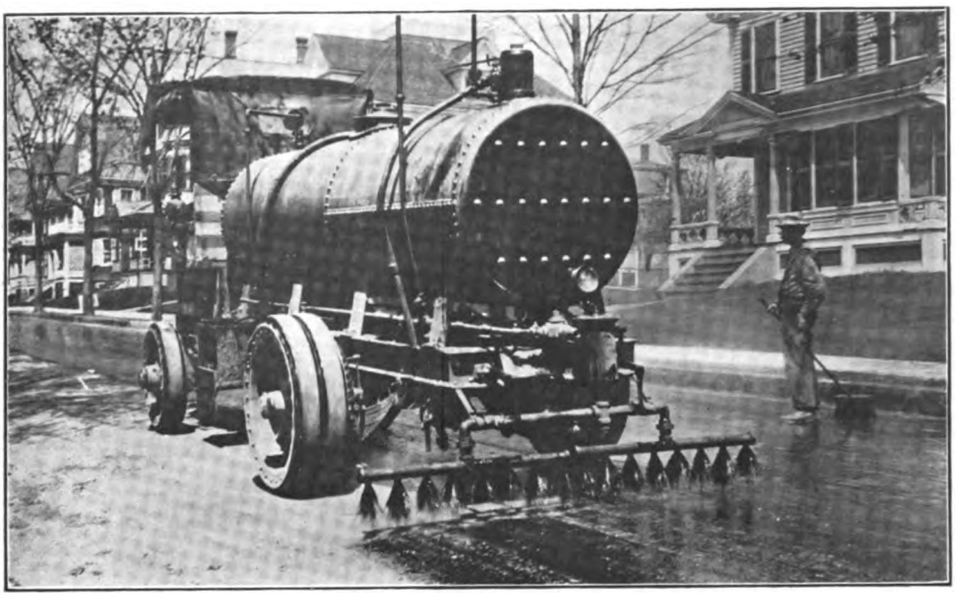
Devices for Spraying.

Different forms of tar spraying machines were used abroad and the Massachusetts state highway commission imported two forms of apparatus, and the Barrett Manufacturing Company one, but these were found to be impracticable for use because of the general conditions under which roads are constructed in this country and they were not equal to the requirements. When disabled the delay for parts and the excessive cost of special work done in this country practically prohibited their use. Then the Barrett Manufacturing Company began experiments to provide



On the Road: These Trucks Have Delivered Tarvia at a Temperature for Application, at Points 50 Miles Distant from the Works.

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Truck Equipped with Power Spraying Apparatus Applying the Heated Tarvia to a Road Surface at a Rate of 1000 Gallons in 75 Minutes.

equipment that would meet all the requirements and still endure. First of all the tarvia A was heated to a high temperature at the works at Everett and was hauled over the road by horses. This worked out well within distances where the time for haulage was such the material would not cool so it could not be applied. As this necessarily limited the radius for delivery the service the company could give was restricted. To extend this was the next endeavor.

Then tank wagons were experimented with, and it was found that by hauling these to the work within any distance in which it was practical to work animals, the tanks could be hauled by steam rollers with hose connections between the boilers and the tanks through which steam could be utilized to heat the tarvia, and temperature and pressure maintained. This equipment was found to work out well from every point of view, but there was the limitation of the horses to be considered. As the tanks contained from 800 to 1000 gallons to haul these 20 miles was as large a day's work as any horses could reasonably be given. The time taken necessarily prolonged the use of the tanks, which were needed all the time work could be continued, and there was much uncertainty through weather conditions.

Tarvia can only be applied when a road is dry and if a haul were made and a storm developed during the time of haulage this necessitated a delay of the tanks until the road had been dried. All of this added to the expense of delivery and the cost was borne by the company. Quick transportation was absolutely essential because of the demand for products during time when work could be performed, and because there was a limit to the delivery equipment that could be maintained. It was also found that there were numerous emergency calls, where a work was held up from lack of material, to illustrate.

Success with Alco Truck.

The company then turned to motor vehicles. The first installation was merely a 1000-gallon tank mounted on a chassis, the tank being filled with heated tarvia and sent over the road to the work, dependence being placed entirely upon the use of the steam supplied by a steam roller, the truck being hauled by the roller during the period of application. This was found to be a material saving in time and to insure a large degree of economy as compared with horses. But as the truck could be sent a distance of 25 or 30 miles with comparatively little reduction in the temperature of the tarvia, and it could be applied with small loss of time, it was believed that by the use of a pumping apparatus to maintain a pressure in the tank applications could be still more economically made. The first truck was used last season, this being a five-ton Alco, and it was worked through the year with decided success, for tarvia X was delivered hot, at a temperature to be applied to the roads, at points as far distant as Plymouth, Mass., and Central Falls, R. I., these being approximately 50 miles from the Everett works.



Applying Tarvia X from a Tank Truck Hauled by a Road Roller, Which Furnishes Steam to Heat the Material and Affords Suitable Pressure.

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The truck was utilized with a steam roller with tarvia X and under ordinary circumstances the tank load could be applied in about an hour and a quarter. As may be assumed this was a decided saving in time and insured a uniformity of application and a high standard of construction, factors of importance to both the company and the contractor for the work. So successful was the equipment that temporarily a three-ton Alco was also fitted with a tank and was used for long hauls for several months.

With the experience gained this season the Barrett Manufacturing Company began to extend its equipment and two more trucks were equipped for service at the Everett works, two were fitted and stationed at New York, and a fifth was sent to Montreal. All of these five trucks carry 1000-gallon tanks and all have heavy power pumps, operated by the motor engine, which will give a high pressure in the tanks and insure an even flow of tarvia from the headers at the rear. The tarvia is distributed over a strip of surface seven feet wide and in an hour and a quarter a mile of roadway can be treated, this requiring a trip in either direction. With the tarvia heated at the works the trucks can be used for delivery and application as well, which is a large saving as compared with horse haulage for any distance beyond 10 miles, and a decided economy in the road treatment because of the work being done by experienced men and having a uniformity that insures endurance; as contrasted with horse haulage and hand work in the use of tarvia there is even a greater saving.

Although the trucks were installed primarily with a view of developing business not possible with horses, they have been found economical for the longer hauls usually done with horses. With the short hauls the time of loading and unloading is so great a factor that horses afford the greatest economy. The following figures taken from the cost sheets of last year will demonstrate to those who are interested in haulage economy some very potent facts, as they show actual expense, but they do not represent the business developed that will no doubt be continued, nor do they indicate the high standard of work possible with the proper handling of tarvia. The detail is of the five-ton Alco truck, which was worked consistently:

Average miles a day	41.14
Ton-miles a day	100.59
Gasoline, miles a gallon	2.46
Total cost a mile	$0.316
Cost a ton-mile	0.130

The costs stated include gasoline, oil, grease, repairs, cleaning, tires, wages, depreciation, and fire and liability insurance.

MANY FAVOR STANDARD TRUCK WARRANTY.

Advices received by the executive committee of the National Association of Automobile Manufacturers show that 14 members out of 33 now engaged in the production of commercial vehicles have definitely adopted the new standard truck warranty and will incorporate it in their new catalogues and contracts of sale. In addition, 14 others, not members of the association, will follow their example.

These concerns are: Members, Baker Motor Vehicle Company, Federal Motor Truck Company, Gramm Motor Truck Company, Kelly Motor Truck Company, Knox Automobile Company, Locomobile Company of America, Packard Motor Car Company, Pope Manufacturing Company, Reo Motor Car Company, Selden Motor Vehicle Company, United States Motor Company, Waverley Company and White Company; non-members, Auglaize Motor Car Company, Brown Commercial Car Company, Chase Motor Truck Company, Champion Wagon Company, Dorris Motor Car Company, Geneva Wagon Company, Gramm-Bernstein Company, Harwood-Bailey Manufacturing Company, Hatfield Auto Truck Company, Kearns Motor Car Company, Sanford Motor Truck Company, Stewart Motor Corporation, U. S. Motor Truck Company and Veerac Motor Truck Company.

There also are four members and nine non-members, who approve the warranty just as it is written and will adopt it if a majority of the truck makers do so. These are: Members, Nordyke & Marmon Company, Ohio Electric Car Company, Walter Motor Truck Company, Willys-Overland Company; non-members, C. L. Barker, Bowling Green Motor Car Company, Chicago Pneumatic Tool Company, Dayton Auto Truck Company, Marathon Motor Works, Moreland Motor Truck Company, Poss Motor Company, Sandusky Auto Parts & Motor Truck Company, H. E. Wilcox Motor Car Company.

Three other members who are not yet actively engaged in the commercial field state that as soon as they enter it on a sufficient scale to have need for a guarantee they will use it. These are: Buick Motor Company, Columbus Buggy Company and Jackson Automobile Company.

Only five members heard from are opposed to the use of the warranty. They are: Autocar Company, Ford Motor Company, H. H. Franklin Manufacturing Company, General Motors Truck Company and Pierce-Arrow Motor Car Company. Their objection is that they do not consider it sufficiently liberal, particularly as regards its duration. They prefer a guarantee for one year, or even, in one or two cases, one without limitation. The Buckeye Manufacturing Company, Driggs-Seabury Ordnance Corporation, National Motor Truck Company and Wichita Falls Motor Company, all non-members, are of similar opinion. In the case of the Buckeye and National companies, their literature is already out, incorporating a year's guarantee, and they do not feel that they can recall this now and substitute the 90-day standard warranty.

The committee feels very much gratified with the results already accomplished and looks for even more general adoption.

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RECENT MOTOR VEHICLE PATENTS

Morton Adjustable Wristpin Bearing.

An adjustable wristpin bearing has been patented by Ezra F. Morton, Lone Pine, Neb. It comprises a pair of blocks, each having a semi-circular opening, a pitman provided with bars having aligned openings, wedges extending through openings, and a locking wedge and means for locking and adjusting same.

Adams Lubricating Device.

Conrad R. Adams, Buffalo, N. Y., assignor to the Pierce-Arrow Motor Car Company of the same city, has been granted a patent for a lubricating device for bearings of the worm drive type of gears, adaptable for the overhead design. A helical blade having an inclination opposite to that of the threads of the worm is mounted between the latter and bearing, and forces the lubricant to the bearing through a longitudinal passage.

Seifried Resilient Hub.

A patent for a resilient vehicle hub has been granted to Earl J. and Isaac G. Seifried, Findlay, O. It comprises a hub having a circular plate with a central opening, a shifting member on each side of said plate, each movable at right angles with the other and in a different plane therefrom, means for cushioning each member and an axle extending through and supported in both shiftable members.

Heller Sanding Device.

Earnest Heller, West Nottingham, O., has patented a sanding device for motor cars, comprising a hopper and a discharge pipe. The latter is so mounted that it may be adjusted to any position by means of a pedal actuated chain and automatically returned to a raised position. In service the discharge pipe is located in front of the wheels, the sand being fed as desired.

Valois-Groise Spark Plug Tester.

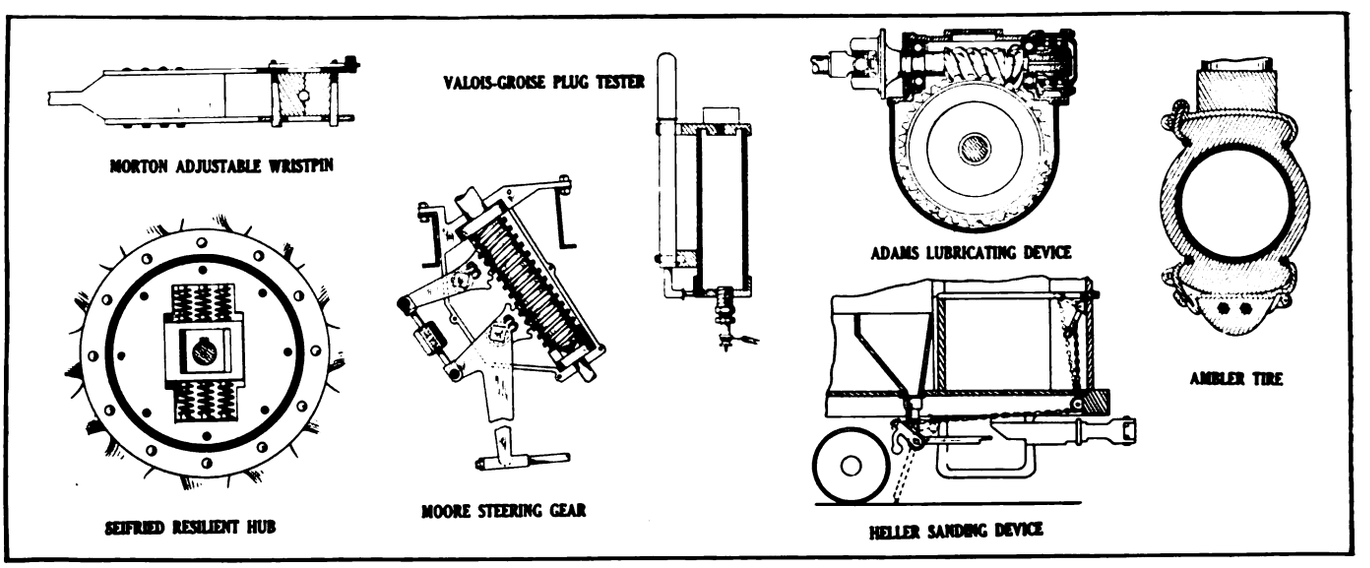
Joseph Valois, Alphonse and Armand Groise, Holyoke, Mass., have been granted a patent for a spark plug tester. It comprises an upper and lower metallic head between which is located a glass tube. The spark plug is screwed into a suitable opening and another aperture is provided for introducing air for compression, the pump being attached and a part of the device.

Moore Steering Gear.

A steering gear has been patented by Van Zandt M. Moore, Cleveland, O., which comprises the combination of a worm shaft and two worm wheels, the latter having opposed engagement with the different worm threads, and turning in the same direction for a given rotation of the worm shaft, means for constraining the worm wheels and an operatable connection from the worm wheels.

Ambler Vehicle Tire.

Howard M. Ambler, Philadelphia, has been granted a patent for a vehicle tire which is a combination of a pneumatic and solid tire. The former is provided with flanges for attaching the solid member, the latter being secured by means of clamping rings.



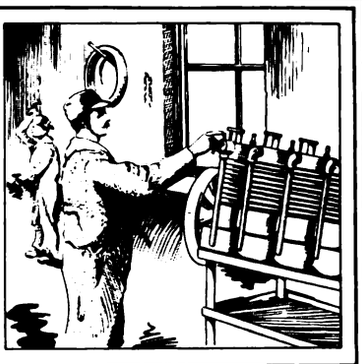
Some Recent Patents of Interest to the Owner, Driver, Garageman and Manufacturer, Including Spark Plug Tester, Sanding Device, Combination Tire, Steering Gear, Etc.

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AINTS·FOR·PROPER MAINTENANCE

A Department for the Owner, Driver and Repairman.



BUILDING A PIT IN GARAGE.

In order to perform successful repair work the garage should be equipped with a pit and the ambitious driver who cares for his own machine will find he will save much valuable time, as well as exertion, by installing one. It makes easy the work of adjusting minor parts and will be appreciated when taking up connecting rods and main bearings, as the work may be performed comfortably and without being obliged to lie upon the floor. In disassembling the steering gear and when the post must be removed it is difficult to handle this member on some cars without a pit.

At Fig. 1 is presented a working plan, the dimensions and material being outlined, and while at first glance it may appear expensive, it can be constructed at a reasonable figure. This design, however, has the advantage of being very durable and easily cleaned.

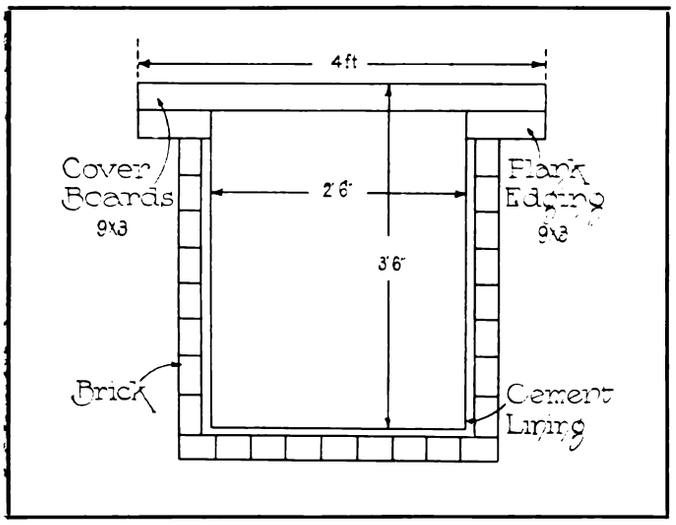


Fig. 1—Outlining Working Plan and Dimensions of Brick and Cement Pit for the Garage.

The depth of the pit outlined is three feet six inches, which is the average of standard pits, although it may be altered to suit the height of the workman. A width of two feet six inches will be sufficient to permit of moving about without undue cramping, while the length may be about four feet.

In the design illustrated the retaining wall is constructed of brick, ordinary members being laid flat and erected to within six inches of the floor level. The bottom of the pit is also of brick. After the mortar has set the pit is lined with any durable cement. Planks, nine by three inches, are utilized to form the support for the cover boards which are also of the same dimensions. These boards are secured together and a ring fitted to enable the cover to be removed and replaced. The cover should be flush with the garage floor.

Another method is to make a box of heavy planking of the above dimensions and paint the outside with a creosote preparation to preserve the wood against the attack of moisture. A design of this type is constructed readily and without expense and the interior may be cemented. A small set of steps may be constructed easily and will save much effort in getting into and out of the pit. They may be left in it at all times.

SPEED OF CUTTING TOOLS.

To obtain the best results from steel utilized for cutting purposes, attention must be given to the use of calculations in determining the proper speed of the work or tool, according to conditions. The average machinist in ordinary practise does not make use of these rules, but depends upon knowledge acquired through experience and observation. For the benefit of those not familiar with rules for finding cutting speeds, and to obviate the necessity for guessing at the proper speed, the approximate cutting speed at which tools should be run in the machining of different metals is given herewith:

	Circumferential Feet a Minute.
Cast iron	14 to 16
Malleable iron	16 to 20
Steel	12 to 15
Brass	28 to 40

The circumstances and conditions upon which depend slight variations of the speeds given are numerous, among which are: Whether a rough or finishing, coarse or fine cut, is being taken; the form and shape of the cutting tools; the toughness and density of the metals being worked upon, and the surface machined without grinding. There is considerable work done in the lathe or planer which requires cutting that projects far out of its holder. For such work the cutting rates must be considerably less than above given. Very often the texture of the metal is tough and hard, necessitating slower working and finer feeds in machining in order to perform successful work.

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REMOVING DENTS FROM BRASS.

Frequently the repairman is called upon to remove dents from the lamps or horn. While the marks may be obliterated to a certain extent by placing a block of wood inside the article and tapping the outside with a wooden mallet, fine wrinkles often remain. These may be eradicated easily by utilizing a burnisher. Place a solid substance on the underside of the object and with a little pressure of the tool on the opposite side, the indentations can be smoothed out. The burnisher should be made of tool steel and highly polished after being hardened. Tools of any desired shape can be made for the work in hand.

CRACKED INTAKE MANIFOLDS.

In fitting new gaskets between the intake manifold and the cylinder care should be exercised in tightening up the nuts on the studs, especially if the design of the intake pipe be such that it will not withstand strains. When the latter is of aluminum, and of light construction, it is cracked easily and sometimes the break will not be perceptible to the eye. As a tiny opening will admit air the mixture consequently is weakened and the motor will run irregularly at low speeds, but operate correctly at a higher rate. When the crack is a small one, a temporary repair may be made with thick shellac, applying several coats and allowing each to dry thoroughly. The repair will endure for some time and the writer operated a car for an entire season under similar conditions.

RULES FOR CALCULATING SPEED.

The following rules may be employed for calculating rotations, also the size of pulleys for given speeds: To find the number of revolutions, given the diameter of the driven, multiply the size of the driver by its number of turns and divide the product by the diameter of the driven. The quotient will be the desired number of revolutions a minute.

When the diameter and revolutions of the driver are known, to find the size of the driven that shall make any number rpm, multiply the given diameter by its number of revolutions and divide the product by the number of required turns of the driven. The quotient will be its diameter.

To ascertain the size of pulleys for given speeds, multiply all the diameters of the drivers together and also the sizes of the driven; divide the former by the latter and multiply the quotient by the known number of rotations of the main shaft.

WELDING A SCORED CYLINDER.

The acetylene welding process is largely employed in repair work and many apparently worthless parts are renovated, saving the expense of new members. An instance of the walls of the cylinder being badly scored by a loose wristpin was noted recently in an overhaul, and the engine being of the block type, it was decided to try to effect a repair by the welding process, as the cuts were too deep to permit of their removal by grinding.

The welding was completed satisfactorily and as it was necessary to make a pattern for a new piston to fit the enlarged bore after grinding, it was decided to have all the cylinders ground to the same size and fit new pistons throughout. The grinding enlarged the bore only .01 inch, so that it would have been entirely feasible to make a new piston to fit that member only, without affecting the torque to any great extent, although it is recognized that pistons should be uniform in weight.

HAMILTON BI-FUEL CARBURETOR.

The increased cost of gasoline in England is stimulating the efforts of the engineers and already several carburetors designed for kerosene have been announced and are being tested. The latest addition to the ranks of the heavy fuel vaporizers is the Hamilton bi-fuel carburetor, an announcement of which was

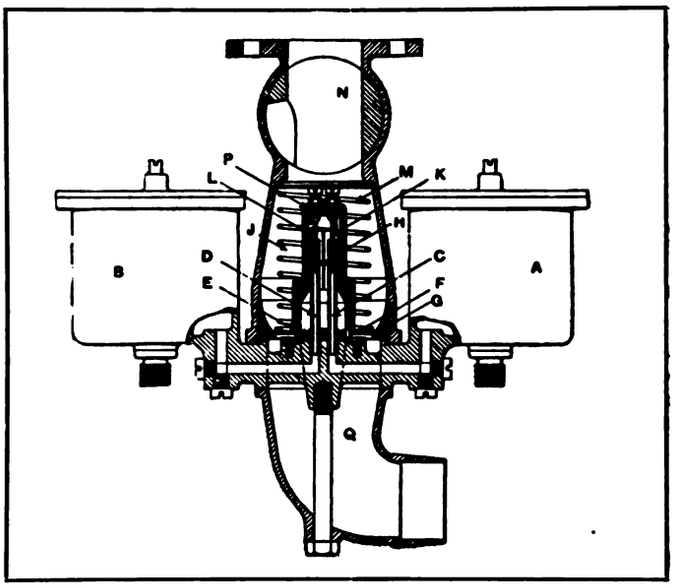


Fig. 2—The Bi-Fuel Carburetor, Utilising Combined Mixtures of Gasoline and Kerosene and Having Two Separate Adjustable Jets.

made in the recent issue of the Autocar, an English motoring print.

As the name implies, the device combines gasoline and kerosene, which does not appear to be an easy matter, but it is stated that the Hamilton carburetor mixes the two fuels successfully and that in practise a motor has been operated on a supply of 60 and 40 per cent. gasoline and kerosene, respectively. This has been accomplished by the utilization of the usual hot air intake pipe, while with the whole or greater part of the induction pipe heated it is stated that the above figures were reversed.

By referring to the carburetor which is depicted at Fig. 2 it will be noted that two float chambers are provided, A and B, for gasoline and kerosene, respectively.

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Two separate jets are also employed, these being outlined at C and D. At the base of the mixing chamber J is the air inlet which forms a ring around the two jets. The fixed air inlet ports E are utilized for slow speed when operating on gasoline. When the air valve F, between the air inlet and the mixing chamber, is closed, only a comparatively restricted air flow can pass to the motor. This it has to do through the ports E, so that all the air used has to pass up the choke tube H.

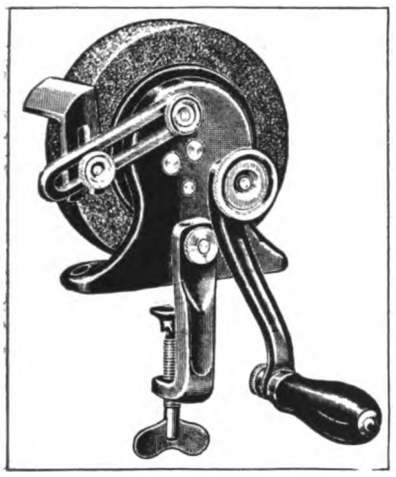


Fig. 3—The Luther Grinding Device.

The seating G, on which the air valve F is pressed by a helical spring M, is formed in the lower part of the chamber J. It will be noted that the seating G of the valve F is curved and shaped in such manner as to graduate the flow of air between it and the air valve, as the latter rises under the increasing suction of rising engine speed, in such proportion to the travel of the valve that the negative pressure in the mixing chamber J remains practically constant.

The air valve consists of something more than a mere flat annulus, for it is carried upwards to form a bridge piece P above the choke tube of the jets, and in this bridge piece the needle valves K and L are held in such position as to regulate the flow of fuel through the two jets. As they screw into the bridge piece and are held by small lock nuts, their position is adjustable, so that the flow of fuel in either jet can be relatively adjusted to requirements.

The operation of the carburetor is best explained by the method of adjustment. In the first place the cross sectional areas of the two fuel jets are so proportioned as to give in general terms the required relative flow of two sorts of fuel. The needle valves are fitted to the bridge, and, with the main air valve shut, the needle controlling the kerosene jet is screwed down until it entirely shuts off all flow of this fuel, while the needle regulating the gasoline orifice is adjusted to allow the passage of just sufficient fluid to carburet the air capable of passing up the choke tube H. Under these conditions it is practically as though the engine were running on a pilot jet, for the supply is sufficient for slow running with no load or starting from cold. Directly the throttle is opened, however, and the engine speed increases, the additional suction raises the air valve F, which thus automatically has the effect of increasing the gasoline aperture and opening up the kerosene jet in its rise. In this way the motor, started on gasoline, is able to continue to run on the fuel mixed in proportions decided by the respective areas of the two nozzles.

THE LUTHER TOOL GRINDER.

A small tool grinder is of service in the garage not equipped with power as by it chisels, etc., may be sharpened and much labor saved. The Luther Grinder Manufacturing Company, Milwaukee, Wis., is marketing a small, compact grinder for the shop not fitted with power and as will be noted by the illustration at Fig. 3 the machine is manually operated. The mechanism actuating it is contained within a hollow wheel and consists of a series of four driving gears and pinions which produce a speed of 20 revolutions to every turn of the handle. All bearings are one-piece and the working parts are fully enclosed and protected from the dust, etc.

The grinding wheel is a composition known as Dimo-Grit, the new diamond sharpening substance, and it is 5.5 inches in diameter. The design is such that it may be disassembled easily and packed in a box 5.75 inches long. An adjustable tool rest is a part of the equipment, also a clamp for attachment to the bench, etc. The tool is constructed of high grade material and is moderately priced.

MAGNA REFLECTOR CLIP.

In working over the lathe, bench, etc., it is important that the light be good. An open electric lamp is not satisfactory as the rays are more or less blinding. The Sachs Laboratories, Inc., Hartford, Conn., is manufacturing a clip for use in connection with its improved reflector and the device depicted at Fig. 4 B is inexpensive and practical. It comprises a one-piece punching of insulated material provided at one end with two curved clip arms which engage the neck of the socket and at the other end with the small curved hook which connects with the flexible cord when the lamp is held horizontally and the light is directed downwards. The socket may be adjusted in the clip

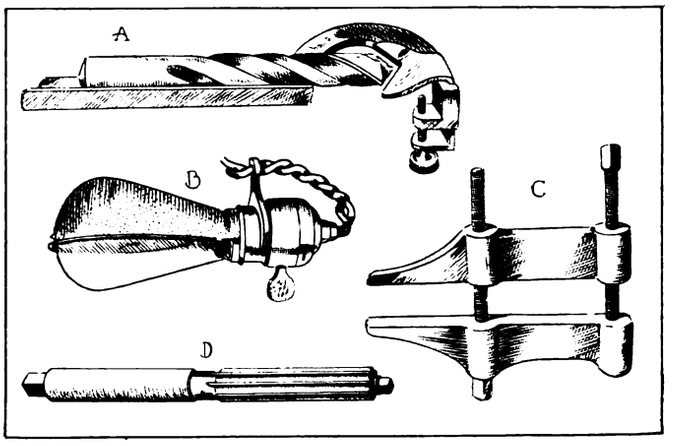


Fig. 4—Useful Tools for the Garage and Repair Shop: A, Remington Twist Drill Grinding Gauge; B, Magna Clip, an Adjustable Device for Drop Lights; C, Le Count Vise Clamp; D, Peerless Expansion Reamer.

and the light directed to any desired angle when the lamp is held in the above position. It is made to fit any standard socket and cord.

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REMINGTON DRILL GAUGE.

Crooked or irregular holes in drilling are invariably caused by the drill not having been ground accurately. The grinding of twist drills is quite an art and they should be accurate if good results are to be obtained. The cutting edges should have a proper and uniform angle of 59 degrees with the longitudinal axis of the drill, and should be of exactly equal length. The lips should be well and sufficiently backed off or cleared, qualities essential for good work and which will make for less grinding.

The Remington Tool & Machine Company, Boston, is manufacturing a simple and practical twist drill grinding gauge which is shown at Fig. 4 A. The drill to be tested is placed in the V groove of the device and the gauge jaw is raised or depressed until the point of the drill is central with that of the V gauge. The cutting edges of the drill should be horizontal with the flat surfaces of the gauge jaw. The latter are milled with an angle of 59 degrees and the cutting edges of both lips of the drill should be parallel with those of the gauge. When one lip is lower than the other the strain comes upon the shorter member, producing irregular and larger holes than the diameter of the drill, and increasing the liability of breakage.

LE COUNT VISE CLAMPS.

The vise clamp serves several useful purposes in the repair shop and the William G. Le Count Clamp Company, South Norwalk, Conn., is marketing these devices, one of which is shown at Fig. 4 C. The clamps are constructed of steel castings, nicely finished and made in six sizes, having openings from 1.25 to 6.25 inches.

PEERLESS EXPANSION REAMERS.

When openings must be enlarged slightly expansion reamers are of service. The Cleveland Twist Drill & Reamer Company, Cleveland, O., is manufacturing a line of these, one of which is illustrated at Fig. 4 D. The diameters of these tools range from .5 inch to 2.5 by thirty-seconds. The company makes sixty-fourth sizes to order. The reamers are constructed of high grade material, carefully finished to correct size and are moderate in price.

CORRESPONDENCE.

Reducing Size of Tubing.

(13)—Am fitting a priming attachment to my car and find that the connection of the device is too small to permit of its taking standard copper tubing. The connector cannot be reamed out without weakening its walls, and I do not care to employ solder as I wish to disconnect the part at times. Have tried to force tubing in connection but made a poor job. Is there not a method of reducing its size? OWNER-DRIVER.
Watertown, N. Y., Sept. 25.

If the tubing is slightly large it may be reduced by utilizing a tap wrench and the operation is outlined in the accompanying illustration. The wrench is placed over the end of the tubing and tightened slowly and easily as the tool is rotated. This will reduce the size as desired and the walls of the pipe will not crimp if the adjustment is made gradually.

Trucks Using Sleeve Valve Motor.

(14)—Are there any trucks marketed in this country that are fitted with the Knight or sleeve valve motor and if so please give name? What trucks use the motor abroad? A. R. G.
Omaha, Neb., Sept. 15.

At present the sleeve valve type of motor is not being utilized by manufacturers of commercial cars in this country so far as announcement has been made. Abroad the Daimler Company, Ltd., Coventry, England, employs the Knight motor, also the Deasy Motor Car Manufacturing Company, Ltd., of the same city. The latter fits it to its ambulance only while the Daimler utilizes it with several models. Argylls, Ltd., Alexandria, Scotland, also employs a sleeve motor of its own design in commercial cars.

Converting Pleasure Vehicle.

(15)—I have an opportunity to purchase a four-cylinder

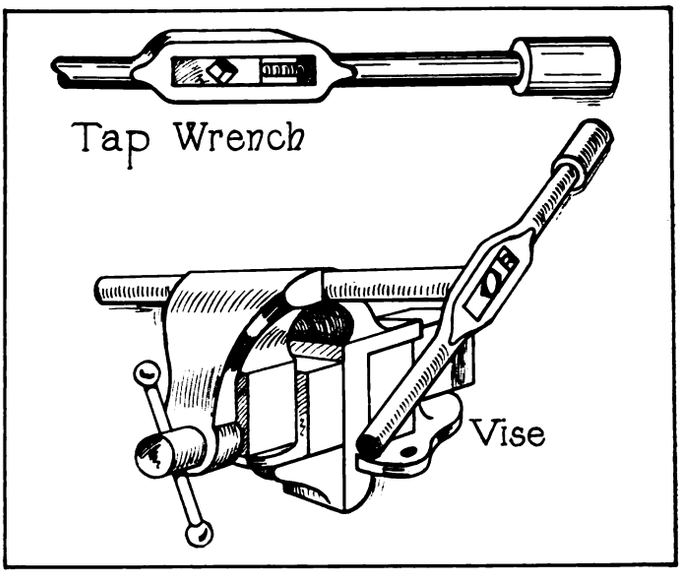


Fig. 5—Depicting Method of Using Tap Wrench to Reduce Diameter of Brass or Copper Tubing.

——— car and am thinking of having a special body built for it and using it for general hauling of merchandise. The loads I haul frequently are one ton or more. Having heard various opinions upon the merits of the converted pleasure car would be pleased to have you advise me if it will give practical results in this line of work. EXPRESSMAN.
Brockton, Mass., Sept. 26.

Although many pleasure automobiles have been built over for commercial work, where heavy loads are to be carried the writer is of the opinion, as are several authorities, that the best investment is a motor car designed especially for transportation. The cost of overhauling the pleasure vehicle and building the body might be considerable and the efficiency of the machine after this work is problematical. As the car is an old model difficulty might be experienced in obtaining spare parts and delays are costly.

A mirror of the round, vest pocket type is handy in reflecting rays of light upon dark places of the car when seeking lost nuts, etc.

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FEDERAL IN MANY LANDS.

Product of Well Known Detroit Concern in Service in All Parts of the World.

As an indication of the all-around ability of the Federal truck, made by the Federal Motor Truck Company, Detroit, it may be cited that within the past few weeks orders have been filled from sections of the globe widely differing in their climatic and geographical conditions. The Federal company claims to be the first to invade Alaska.

The Consolidated Development Company of Nome, said to be the largest ore mining corporation in Alaska, sent two representatives to the States in quest of a one-ton truck that would overcome the difficulties encountered in these regions. After making a thorough investigation of what the market had to offer, they placed an order with the Standard Motor Car Company, Federal agent in San Francisco, calling for three one-ton vehicles which will be utilized in hauling ore from the mines among the mountains to the export stations along the coast.

About the same time a representative of Futubaya & Co., Tokio, Japan, conducted a similar investigation of the American one-ton vehicles, with the result that an order was placed for a Federal of this capacity. The concern is a large exporter and importer, and decided in favor of the Detroit product because of its simplicity and "ever-readiness."

The American Motor Truck & Auto Company, Melbourne, Australia, sent three men to this country to look over the one-ton vehicles with a view to establishing an agency in Melbourne. All three decided in favor of the Federal and the contract was signed.

CONCERNING TRUCK EFFICIENCY.

G. M. C. Officials Suggest Factors Which Should Enter into Consideration of Problem.

According to Gleeson Murphy and F. L. Ditzler, officials of the Generals Motors Truck Company, Pontiac, Mich., who have been visiting the principal eastern G. M. C. branches, the attitude of big business institutions toward the commercial motor vehicle is changing very rapidly. The question no longer seems to be as to whether or not concerns can safely adopt mechanical transportation, but rather as to how they can best equip their business with motor trucks. They say:

"As a result of our experience with commercial vehicles and our study of the entire matter, it seems to us that any prospective purchaser of such equipment will find his problem greatly simplified if he will first answer for himself a few fundamental questions.

"First—What is the nature of the routes to be covered in the service? Is it all a town service or all a country service, or does it partake of both characters?

"Second—What is the general character of the street and roads? Are they comparatively level or are steep hills numerous?

"Third—What are the distances which each vehicle must cover in a day's round?

"Fourth—What is the character of the load to be carried? Is it light but bulky, or heavy in comparison with the bulk?

"Fifth—Are the packages to be carried of large size, such as heavy furniture, pianos, safes, or the like, or are they small, such as groceries, jeweller's boxes, light dry goods, etc.?

"Sixth—Are the goods and packages of such a nature that they must be protected from dust and rain, or can they be carried in open wagons or those with so-called express bodies?

"Seventh—Are they of a fragile nature, calling for unusually flexible spring suspension if the load is to be moved at speed?

"Eighth—What quantity of goods will usually be loaded up for each trip? Will the load be carried the full distance, or only half the distance? Do the vehicles ordinarily return empty, or are they partly loaded?

"Ninth—What is the most convenient body construction to admit of easy loading and unloading of the class of goods to be handled?

"Tenth—Would it be desirable in the case of heavy goods to enable the power of the motor to be utilized in loading and unloading?

"Undoubtedly there are many others, but those mentioned are sufficient to indicate how numerous are the points to be kept in mind. It is quite plain that three points—load to be carried, distance to be travelled and country to be covered—must all be considered carefully."

A Brush light delivery wagon, made by the Brush Runabout Company, Detroit, has proved an efficient method of delivery for J. A. Rohner of Akron, O., for the past three years. He claims that there was not an extra dollar of expense for running during the first two years, but during the third year he had to expend $40 for repairs. The wagon does the work of two horse drawn vehicles. Pneumatic tires were fitted to the vehicle in the first place, but now it is equipped with Motz cushion tires, which the owner believes better suited to this style of service, than the pneumatic.

The Moon Motor Car Company of St. Louis, Mo., recently received an order from the city of Boston, Mass., for a Moon motor patrol. The contract was secured in competition with 32 other manufacturers of automobile patrol wagons. The same company also recently received a contract, in competition with 29 other manufacturers, to supply St. Louis with three machines, an ambulance and two touring cars. St. Louis' first order for a Moon car was placed in 1910, when a motor patrol was purchased. The maker has reason to feel pleased because of the repeat order.

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ECONOMY IN POLICE DEPARTMENT SERVICE.

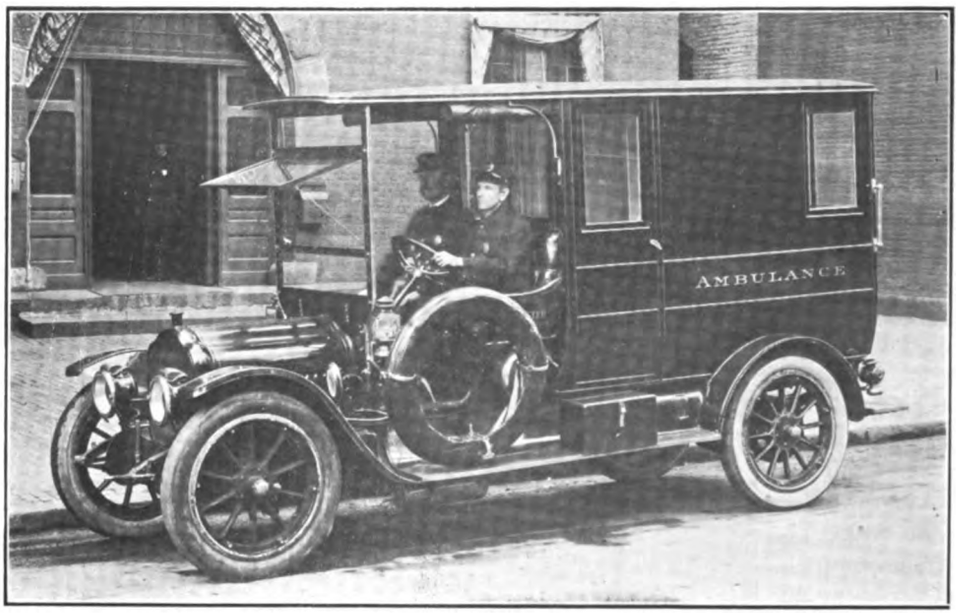
Experience of Worcester, Mass., with Two Patrols and an Ambulance, All of the White Make, Indicates Decided Efficiency at Substantial Saving in Expense.

By C. A. French.

MUNICIPAL authorities are interested in economical administration. This is true despite the well defined opinion that the finances are not guarded with that care which would be manifested in the private business. Office holders and tax payers watch the tax rate carefully. Sometimes economy is effected at the expense of efficiency, and often the public is as much to blame as the administration.

With special reference to motor equipment, it may be assumed that automobiles are much more efficient than horses. This applies particularly to the fire and police departments, although it has been demonstrated that the same results can be obtained in other branches of the city's activity. It is not always possible to show a marked economy, however.

In the fire department, for instance, there are two well defined factors making for economy. One of these is apparent, and the other must be calculated with care, though it is none the less real. If it is possible to show that a given piece of motor driven fire apparatus has cost a certain figure and that this figure is less than for for a corresponding horse drawn outfit, the economy is so apparent that the tax payer is satisfied at the outset. But it is more difficult to convince the general public that dollars are saved to the individual tax payers by the increased efficiency of the department—that because fires are extinguished before they have had time to become serious, the total taxable wealth has been affected in a material degree.



White Ambulance in Service with Worcester Police Department at Headquarters.

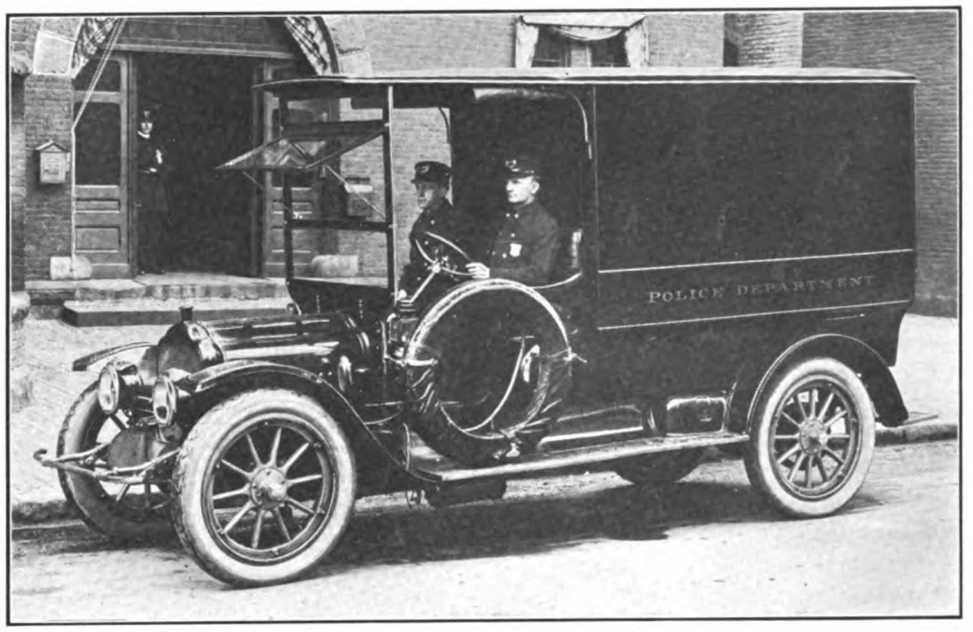
And if this be difficult with the fire department, it is even more so with the police. Police efficiency is demanded above all things, but economical efficiency, if there be any such thing, is wanted. And here again that unapparent economy makes itself felt, since the most efficient protection possible reduces the danger of individual loss and has its effect upon the total taxable wealth.

Where the ambulance work is delegated to the police department, as it is in a large number of cities, there is even greater need for efficiency, since in matters of life and death economy has little place. There is little room for argument relative to the use of motor ambulances, particularly as the emergency calls are most frequent during those seasons when the horse is least able to respond. And this holds especially true in the hill towns and cities of New England.

For the past year the police department of Worcester, Mass.—a city, which like Rome is built on seven hills—has had three White vehicles, two patrols and an ambulance, made by the White Company, Cleveland, O., and sold through Harvey Cashman of the White Motor Car Company in that city. Chief David A. Mathews expresses himself as highly pleased in every respect with their performance. The city has kept very accurate record of the gasoline, oil, grease, etc., used by these three cars, and while the accounts for each have not been segregated, the figures present a very interesting situation with reference to economy.

One of these patrols and the ambulance are housed at headquarters on Waldo street, while the other patrol is at Station 2 on Lamartine street. The patrols are not permitted to leave the city, but the ambulance has been sent over the city line on a few occasions, in cases of emergency. Whenever it does work for other municipalities Worcester makes a charge for such service. A table of calls and mileage, presented herewith, shows the amount of work the three cars have been called upon to do, the ambulance calls being listed separately, although the two patrol wagons are consolidated.

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White Patrol No. 1, Stationed at the Headquarters on Waldo Street.

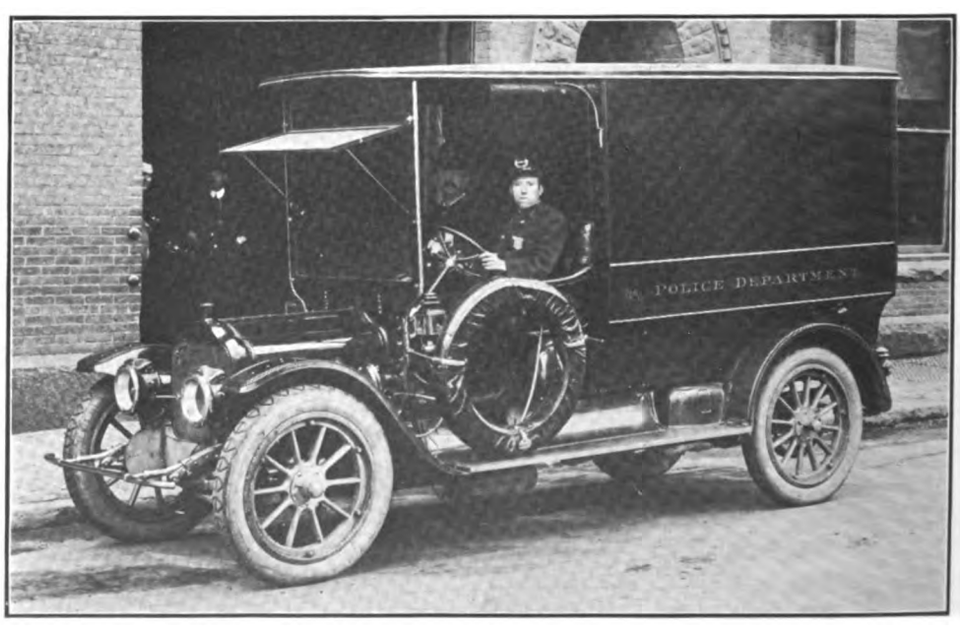
The city buys its gasoline in barrel lots, under contract, and has been fortunate in securing a price of 10 cents a gallon. Its oil is bought in the same manner, the cost figuring out at 46 cents a gallon, for an oil of specially high grade. The grease also is purchased in bulk. Another table sets forth the amount paid for these three items during the past six months, and affords a means for determining the average monthly or yearly expense. It may be stated that the fiscal year of the city does not expire until Dec. 1, and detailed figures on all items will not be available until after that time.

The police department has no horses at present. The space formerly utilized as a stable is now used as a repair shop, under the direction of Edward E. Wilson, as head mechanic, and here all necessary repairs are undertaken by him, assisted by the chauffeurs on duty. Each vehicle has been unfortunate enough to be in at least one serious accident. One of these cost the department $100, although an automobile man estimated the cost would be in the vicinity of $400 before the work was begun. The municipal repair shop does not contain every tool of value in undertaking such repair jobs, but the amount of outside work necessary has been surprisingly small, under the circumstances. The other two accidents mentioned cost the city $15 and $20, respectively. Of course, this does not include the salary of the head mechanic, but since no more men are employed with the motor cars than with the horses, this is not deemed necessary.

The tire problem naturally has been found the most difficult of solution. Tire work is undertaken in the police repair shop, and no less than four prominent makes of shoes have been tried out in this work. Mr. Wilson declares that the best that could be obtained with three of them was from 1600 to 1700 miles. Those used at present, and for the past six months, are of the Swinehart make, and from these an average of 2500 miles has been obtained, although one pair resulted in 3000 miles of service. The present figures of the department show that the tire expense has been about five cents a mile. Since pneumatics are employed, and no attempt is made to use extreme care in rounding corners, etc., on hurry calls of this nature, the result obtained from these Swinehart tires is decidedly satisfactory to the department. It is possible that the complete figures for the year, which have not been tabulated, will present a somewhat better result.

In another table is shown the comparative costs of the horse equipment for four months, these figures being taken for the first four months of service with the automobiles, and the corresponding months of the previous year when horses alone were employed. It should be stated that the ambulance and one patrol were placed in service in October, 1911, and the other patrol about a month later.

Under the old regime, eight or nine horses were fed and maintained all of the time, and it often be-



White Patrol No. 2, Connected with Station 2 on Lamartine Street.

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CALLS AND MILEAGE FOR ONE YEAR.

Month	Ambulance Calls	Ambulance Miles	Patrols Calls	Patrols Miles
September	258	739.0	441	446.0
October	239	855.0	429	457.0
November	222	739.0	428	473.0
December	256	653.0	452	575.0
January	267	940.0	363	401.0
February	284	978.0	378	553.0
March	309	1067.5	434	770.5
April	287	939.0	472	759.0
May	274	999.0	544	875.5
June	288	973.5	467	793.5
July	334	1118.0	571	1064.0
August	306	1042.0	580	962.5

came necessary to hire a horse or two to replace those on the sick list. The three accidents previously mentioned occurred during the four months listed in the comparative table, and the tire expense was somewhat larger during that period. The comparison offered in this table hardly does justice to the motor vehicles, therefore, and is presented only as indicating the exact experience of the department with its new vehicles.

A comparative estimate has been made for one year, this being based upon the results, so far as it is possible to learn them at this time, as submitted in the other tables, with the exception that the accident item is distributed over the entire year. No attempt has been made to consider the first cost of either equipment. The table is one of maintenance costs only.

Referring once more to the table of calls and mileage: It will be noted that the total of calls for the ambulance during the year ending Sept. 1, 1912, was 3324, while the annual report of Chief Mathews for the fiscal year ending Dec. 1, 1911, shows 2948 calls for that year. This would indicate an increase of approximately 12.5 per cent. The same sources of information give a total of 5759 calls for the two patrols in 1912 as against 5017 in 1911, a gain of practically 16.6 per cent.

The increase in mileage covered also is of decided interest. The ambulance covered 8794.7 miles in 1911, and 11,043 in 1912, an increase of a little more than 25 per cent. The patrols were run 5314 miles in 1911, and 8130 in 1912, a gain of nearly 53 per cent. Of course these figures overlap to a certain extent, but they are sufficiently accurate to indicate the manner in which the amount of work has increased during the year.

It would appear from these tables that the city of Worcester has secured from 25 to 50 per cent. more efficiency at an economy of at least $135.17 in maintenance costs through the installation of White motor vehicles. Basing the estimate upon the figures contained herein the maintenance cost for sufficient horses to cope with this additional work would have been $2959.65, showing a balance in favor of the automobiles of over $1000. With a continued corresponding increase in efficiency, it would take but a short time to wipe out the first cost of motor vehicles.

The experience of the Worcester police department will prove of decided interest to those who are studying economy in municipal service. Chief Mathews declares the White cars have given splendid satisfaction. There never has been a time when they were not ready to respond. The patrols answer all fire alarms as well as regular police duty calls, and often they have been pressed into service as ambulances, when the ambulance and surgeon were absent on a two-mile hurry call. The entire department is satisfied that when the fiscal year is ended the showing will be even better than the present figures indicate.

AUTOMOBILE SUPPLY ACCOUNT.

1912	Gasoline	Oil	Grease
March	$35.50	$0.55	....
April	46.50	....	$1.30
May	24.80	16.35	....
June	43.00	0.55	1.30
July	47.00	17.85	....
August	47.00	0.55	4.00
Totals	$243.80	$35.85	$6.60

Talbot with the Victor—Frank R. Talbot, who for several years has been connected with prominent rubber companies in Akron, O., has become affiliated with the Victor Rubber Company, Springfield, O. F. B. Patrick, a well known newspaperman, formerly of the advertising staff of the Chicago Evening American, also has joined the Victor force and will be employed in the advertising and sales departments. The Victor company is increasing its capacity in order to take care of the rapidly growing business in its truck tire department.

Hathaway Succeeds Whitney—At the annual meeting of the Commercial Motor Vehicle Association at Boston recently, J. S. Hathaway of the White Company was elected president to succeed J. F. Whitney of the Whitney-Barney Company. Plans for the next commercial vehicle show at Boston, to be held March 19-26, were discussed.

COMPARATIVE FIGURES FOR FOUR MONTHS.

Horse Drawn Vehicles.

	Hay & Grain	Wagon Repairs	
October	$99.70	....	
November	....	$3.25	
December	400.14	15.50	
January	130.86	21.80	
Totals	$630.70	$40.50	$671.25

Motor Driven Equipment.

	Supplies	Repairs	
October	$175.66	$21.80	
November	94.62	16.10	
December	120.46	167.39	
January	110.57	26.15	
Totals	$501.31	$231.44	$832.75

COMPARATIVE ANNUAL EXPENSE.

Horse Drawn Equipment.

Hay and grain	$1892.10	
Wagon repairs	121.50	
Total		$2013.60

Three Motor Vehicles.

Gasoline	$487.80	
Oil	71.70	
Grease	13.20	
Tires	610.51	
Repairs	444.32	
Insurance	251.10	
Total		1878.43
Balance in favor of automobiles		$135.17

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NEWS OF THE COMMERIAL VEHICLE INDUSTRY.

United States Motor Company in the Hands of Receivers and Plans Offered for Its Reorganization---Kissel Company Secures New Plant---LaFrance Seeking Capital.

The situation with reference to the financial condition of the United States Motor Company, New York City, capitalized for $42,500,000, was brought to a decided head Sept. 12, when the Brown & Sharpe Manufacturing Company, Providence, R. I., filed a bill of complaint in the United States court of equity, alleging that the concern was insolvent and asking for the appointment of a receiver. Later that same day Judge Charles M. Hough of the United States district court for the southern district of New York, appointed W. E. Strong, a representative of the banking interests and recently chosen a director of the United States Motor Company, and Robert Walker, an attorney, as receivers. These men have instructions to continue the business of the concern and report to the court by Oct. 28. Still later the same men were appointed ancillary receivers to look after the business of the various subsidiary companies in their several cities.

The present difficulty had its origin some time in June, when it became known that the company would be unable to meet some $750,000 in paper then due, and an extension of 90 days was granted by a creditors' committee. At that time an advisory committee was appointed, some of the members being representatives of the financial interests involved, its object being to continue the business and to give equal protection to all creditors. This grace period expired Sept. 13.

Several plans for reorganizing the company, or at least of refinancing it were considered by the advisory committee, and a number of interviews were granted in which it was stated that the condition of the company was such that if it could secure necessary money all difficulties would be met. It is stated that the action of the Providence concern was taken with the approval and at the request of a majority in amount of the entire indebtedness, representing claims of some $7,000,000. The Brown & Sharpe company is a creditor for $70,000 in merchandise.

According to the petition the liabilities of the company are estimated at $12,250,000, consisting of $6,000,000 of debenture bonds and claims against the company by banking interests and for merchandise totalling $6,250,000. The assets are claimed to be valued at $15,000,000, these consisting of cash, bills receivable, etc., and are held to be embarrassed by the factory plants of the subsidiary companies, which are scheduled at $6,250,000, against which there is a mortgage of $200,000. Quick assets of July 31 are said to be $9,250,000, of which $4,000,000 represents factory inventories and the remainder cash in hand and bills receivable.

The suit involves all of the subsidiary companies, including the Maxwell-Briscoe Motor Company, Tarrytown, N. Y.; Columbia Motor Car Company, Hartford, Conn.; Dayton Motor Car Company, Dayton, O.; Brush Runabout Company, Detroit, and Alden Sampson Manufacturing Company, Detroit. It is understood that the capital stock of the E. R. Thomas Motor Car Company, Buffalo, N. Y., also was acquired by the United States Motor Company, some time within a year, and as this concern already is in the bankruptcy court it appears to be difficult to determine just how the suit affects this. There also are a number of companies engaged in manufacturing parts, etc., which are subsidiary concerns of the United States Motor Company.

It is stated that all of the subsidiaries, with the possible exception of the Brush Runabout Company, and of course, the E. R. Thomas Motor Car Company, are continuing production in about the same manner as they were 90 days ago. The receivers are said to have obtained permission from the court to advance sufficient money to meet the payrolls at the various plants from the general funds of the company and to make provision for administration.

Briefly stated, it would appear that the total indebtedness of the United States Motor Company is divided into two classes, the first of which is represented by commercial paper bearing two indorsements, one by the parent organization and the other by at least one of the subsidiary companies. The other class has paper with only one indorsement, and it is stated that practically all of the claims for merchandise are of this class.

Under the receivership action there are held to be two courses of action open to the company. The first is reorganization under some plan that will take care of the creditors and permit the company to secure sufficient working capital to manufacture and sell its product. It is stated that about $5,000,000 is needed for these purposes. The other course is a sale in open court.

The committee is still at work formulating a plan for reorganization, and any attempt to state the amount of assessment or the method proposed is held to be premature by the committee. However, some mention has been made of a possible assessment of $20 or $25 a share, which former figure is said to be sufficient to raise about $4,600,000. At $25 a share, some $5,750,000 would result, and this is held to be sufficient for all present needs. There is a suggestion as to a compromise on $22.50 a share, but no definite statement has been made.

According to the petition filed in court it would appear that the subsidiary companies are indebted to the parent organization and are liable as makers or indorsers of notes as follows:

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Alden Sampson Manufacturing Company.

United States Motor Company	$1,069,278.72
Notes and accounts	50,014.13
Total	$1,119,292.85

Brush Runabout Company.

United States Motor Company	$1,027,663.38
Notes and accounts	6,650.29
Total	$1,034,313.67

Columbia Motor Car Company.

United States Motor Company	$256,134.23
Notes and accounts	149,406.92
Total	$405,541.15

Dayton Motor Car Company.

United States Motor Company	$2,045,358.72
Notes and accounts	416,578.67
Total	$2,461,937.39

Maxwell-Briscoe Motor Company.

United States Motor Company	$69,929.83
Notes and accounts	1,909,949.25
Total	$1,979,879.08

The total money on hand and receivables of the subsidiaries on Sept. 7, 1912, according to the same source of information, were as follows:

Alden Sampson Mfg. Co.	$40,315.79
Brush Runabout Co.	79,787.21
Columbia Motor Car Co.	31,036.02
Dayton Motor Car Co.	247,252.69
Maxwell-Briscoe Motor Co.	282,761.27

KISSEL COMPANY EXPANDS.

Purchases Additional Plant in Milwaukee, Greatly Increasing Its Annual Output.

One of the most important announcements of the month is that of the Kissel Motor Car Company, Hartford, Wis., which has purchased the plant of the Romadka Trunk Company in Milwaukee. This news follows closely that of the completion of factory additions in Hartford, giving an increase of 40,000 square feet of floor space. The Milwaukee plant is modern, completely equipped and contains some 200,000 square feet of working floor space.

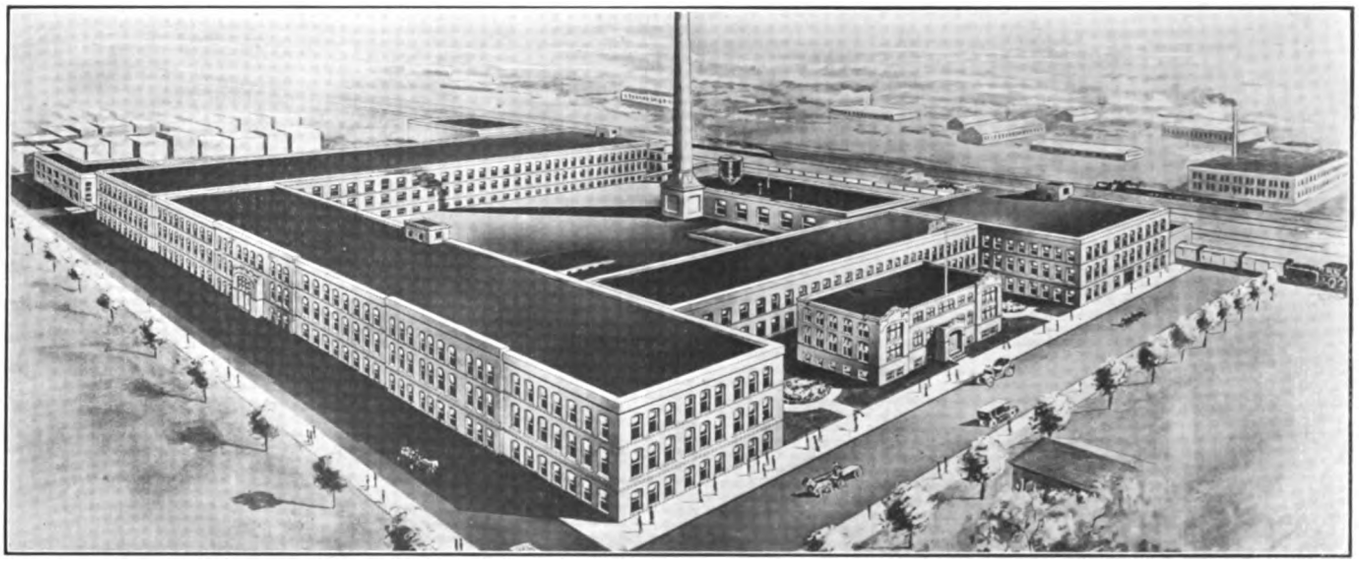
The Kissel company states that the new factory is ideally designed for its needs and that it will afford opportunity to produce 10,000 KisselKars, pleasure and commercial, a year. The general offices of the concern will be removed to Milwaukee, and it is anticipated that the plant will be in operation early in November. At present it will be used exclusively for assembling purposes, the production of parts being continued at Hartford.

The rapid expansion of this company within the past few years has brought it into unusual prominence. Inside of six years it has grown from a $50,000 corporation to a concern capitalized for $1,000,000 and with a surplus of $500,000.

LAFRANCE WILL REORGANIZE.

Increased Demand for Automobile Fire Equipment Makes More Capital Necessary.

According to information from Elmira, N. Y., the American-LaFrance Fire Engine Company of that city is contemplating a complete reorganization, as a result of which it will be provided with some $600,000 in additional cash capital. A greatly increased demand for automobile fire engines of the type manufactured by this concern is said to have made the present move necessary.



Plant of the Romadka Trunk Company, Milwaukee, Wis., Recently Purchased by Kissel Motor Car Company.

It is understood that the plan proposed by the fiscal agents of the company provides that the present bondholders will receive 100 per cent. in 7 per cent. preferred stock of the new company with a bonus of 33.3 per cent. in new common stock. The preferred stockholders are to receive 50 per cent. in the new preferred stock and 33.3 of common, while the present holders of common stock will receive 30 per cent. in new common. With the $600,000 new preferred stock to be sold at par there will be a bonus of 100 per cent. of new common, this being offered to present stockholders on a basis of four shares of preferred to every 10 shares of the old preferred and two shares of the new preferred to each 10 shares of the common.

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NEW GENERAL MOTORS HEAD.

W. L. Day Becomes Vice President and General Manager in Charge of G. M. C. Production.

William L. Day, formerly general sales manager of the Mitchell-Lewis Motor Car Company, Racine, Wis., has resigned his position with the latter concern to accept the position of vice president and general manager of the General Motors Truck Company, Pontiac, Mich., to which he was recently elected. The announcement was made by President Thomas Neal of the General Motors Company, the news coming as an interesting development to those concerned in the vehicle end of the industry.



William L. Day, General Manager, General Motors Truck Company.

Mr. Day, previous to his advent in the automobile business, was for 27 years a prominent figure in the implement industry, being associated with the Parlin & Orendorff Plow Company, Kansas City, Mo. He is an able and efficient executive and his years of experience in marketing and production will prove valuable in his new duties.

Gleeson Murphy, who was temporary vice president and general manager of the General Motors Truck Company, will return to his regular work of assistant to the president of the concern, in which position he has become widely known throughout the industry as an expert on motor truck problems.

BROCKWAY LINE COMING.

New Concern Organized in Cortland, N. Y., to Produce Three Interesting Models.

The Brockway Motor Truck Company, Cortland, N. Y., has been incorporated with a capital of $100,000 to manufacture a line of high grade medium priced commercial motor vehicles in three models with load carrying capacity of 1000-1500 pounds, 2000-2500 pounds and 3000-4000 pounds respectively. George A. Brockway is president of the concern, C. S. Pomeroy, vice president, and F. R. Thompson, treasurer and general manager.

Mr. Brockway, the president, is known throughout the United States as a manufacturer of high grade carriages and wagons, being also president of the W. N. Brockway Company, Homer, N. Y., a concern known in this country for the past 60 years. Rodman S. Reed is chief engineer and superintendent of the company, being formerly connected for six years in a similar capacity with the Chase Motor Truck Company, Syracuse, N. Y.

CONTRACT FOR ADDITION.

Maker of Pope-Hartford Line Completes Arrangements for Increase of Production Capacity.

The Pope Manufacturing Company Hartford, Conn., maker of the Pope-Hartford pleasure and commercial vehicles, has let the contract for a substantial addition to its plant, made necessary by the rapid influx of orders. It will be four stories high, besides a basement, adding 70,000 square feet of floor space.

The walls will be mostly of steel sash windows, while the column spaces will be wide, with shallow floors. A semi-detached tower will contain all elevators, stairways, etc., and a runway will connect with the basement garage. A passageway cut through the building will give entrance to the plant.

BECOMES DISTRICT MANAGER.

R. B. Curtiss Leaves Royal Equipment Company to Sell Chase Trucks in Middle West.

Royal B. Curtiss, formerly sales manager of the Royal Equipment Company, Bridgeport, Conn., has resigned to become district manager of the Chase Motor Truck Company, Syracuse, N. Y., maker of the Chase truck. Mr. Curtiss will have his headquarters at Cleveland, O., and will have jurisdiction over territory embracing Ohio, West Virginia, Kentucky, Indiana, Illinois (except the vicinity of Chicago), Michigan and Western Pennsylvania.



Royal B. Curtiss, District Manager, Chase Motor Truck Company.

Mr. Curtiss regretted the necessity of severing his relations with the Royal Equipment ment Company, but the prospect of connecting himself with the delivery wagon feature of the automobile industry appealed strongly to him. He is well known to many who are interested in the manufacture of motor cars and accessories and carries with him to his new position the well wishes of many friends.

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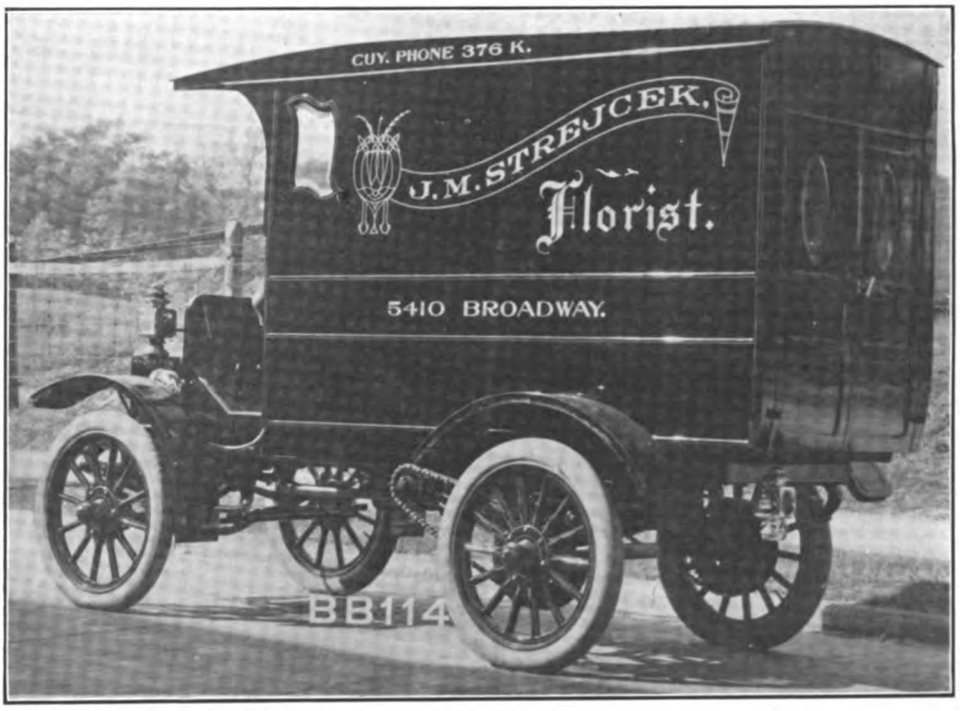
MORA 1500-POUND DELIVERY WAGON.

BELIEVING that the largest field in the commercial car industry is in the 1500-pound capacity class, the Mora Power Wagon Company, Cleveland, O., has concentrated its efforts upon the production of a high grade machine of this type. It is not amiss to state that the men connected with the organization have had years of experience in building pleasure cars and while no details from the lighter machine have been copied those features making for simplicity, reliability and low cost of maintenance have been incorporated. Qualities emphasized of the Mora product are high grade material and the best of workmanship, simplicity and accessibility.

Two-Cylinder Power Plant.

The subject of power plant received decided consideration by the designer of the Mora, and after a careful investigation of the various factors entering into the power vehicle delivery, the two-cylinder engine was adopted. Of this type the company points out that it provides continuous efficient service with minimum cost of maintenance and that it is well adapted to delivery work.

The Mora motor is a four-cycle, double opposed, horizontal, water-cooled unit having a 4.5-inch bore and stroke, developing 16.2 horsepower according to the S. A. E. formula, although it is stated that it has exceeded this rating in brake tests. It is located under the hood, is very accessible, and the starting crank is located in front, secured to the cross tie-bar of the frame extension.



The Mora 1500-Pound Delivery Wagon in Which Is Incorporated High Grade Material and Workmanship.

The cylinders are cast of a special gray iron, carefully machined and ground to size, and may be removed easily, being bolted to the crankcase, which is so designed that it is a simple matter to disassemble the power plant. The pistons and rings are ground to size and carefully fitted, insuring good compression and a well balanced motor.

The valves are of liberal diameter and are adjustable. This is secured by a threaded member in the pushrods and it is an easy matter to loosen the lock nut and compensate for wear. The pushrods are of liberal size and the portion carrying the adjusting device is offset. The pushrods are slotted and the construction of the bushings is such that the members cannot rotate.

Lubrication and Cooling.

Lubrication is by a combination splash and force feed system. A four-feed mechanical oiler is mounted upon the dash in plain view of the operator, and supplies oil to the working parts. It is actuated by an eccentric driven off the camshaft, which is extended through the crankcase for this purpose.

Cooling is by the thermo-syphon principle, cooled fluid being taken from the bottom of the radiator and led through pipes to the bottom of the cylinders, flowing thence through the water jackets to the outlet pipes on top of cylinders and to the top of the radiator. The pipes are ample in diameter and are threaded into the cylinders, connection between which and the cooler is by rubber tubing of substantial construction. The radiator is of the cellular type, mounted in front, and being of ample capacity, maintains proper temperature of the water under all conditions of service. Cooling is assisted by fan shaped blades cast integral with the flywheel which is in front of the power plant.

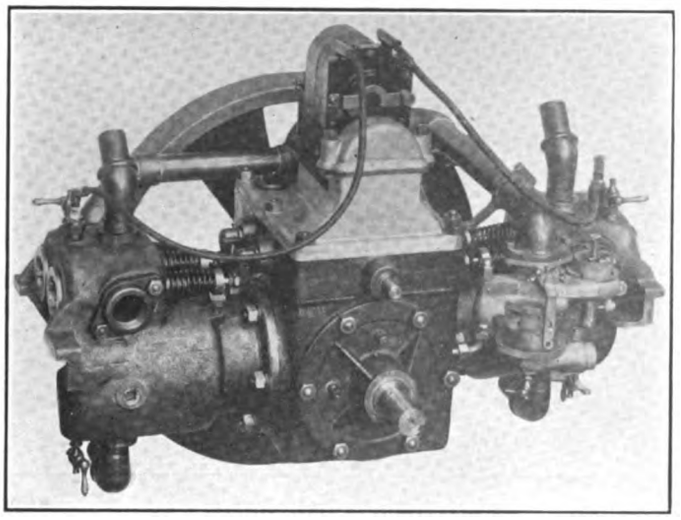
The carburetor is a Stromberg mounted upon the right of the motor and just back of the right hand cylinder, a position affording complete protection as well as facilitating carburetion through proximity to the heat thrown off by the cylinder. The intake pipes are well designed, being free from bends, and the main member is supported by an adjustable brace bolted to the upper crankcase. The vaporizer is readily accessible for cleaning, adjustment, etc.

Fixed Ignition Employed.

A true high-tension magneto is employed for ignition, eliminating the battery, coil and numerous wires, and by it the motor may be started on a quarter turn of the starting crank. It is mounted upon the upper half of the crankcase or inspection plate, a special base being incorporated in the design. This inspection

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plate is provided with a large filler cap for replenishing the supply of lubricant in the crankcase and the part may be removed easily and without disturbing

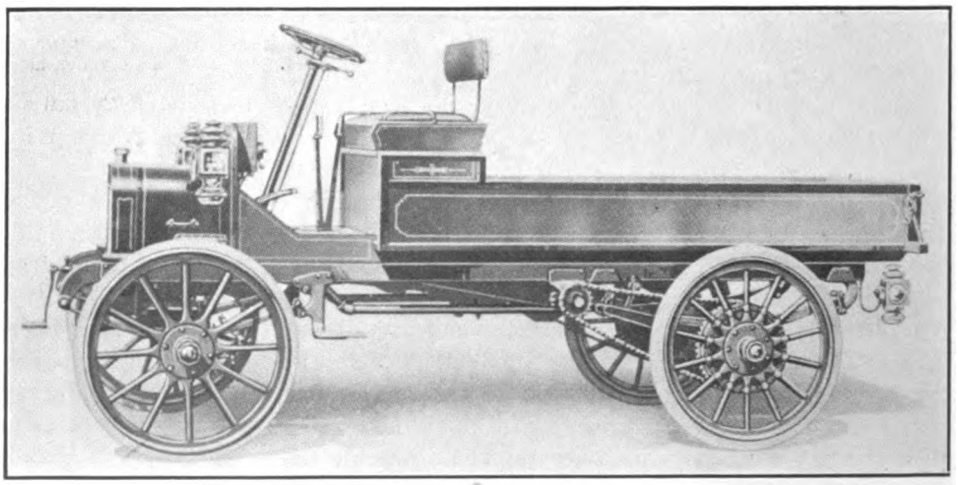


The Power Plant of Mora Delivery Car Is Noticeable for Simplicity and Accessibility.

the water pipes, intake members or other components. The magneto is gear driven off the camshaft. Proper meshing or timing of the gears is possible through the design of the upper crankcase, it being made in two sections, one of which fits over the driving gears. By removing two nuts these members may be seen plainly.

The magneto is of the fixed spark type, the company maintaining it provides maximum efficiency, simplifies the operation of the car and prevents damage to the motor through improper use of the spark lever. With this system but one lever is mounted upon the steering wheel, the throttle member. The spark plugs are vertically located between the valves and petcocks are fitted to each cylinder for priming purposes, etc. The valve caps are very accessible, making it an easy matter to grind valves when these members require attention.

Believing that the planetary transmission is best suited to cars operated by inexperienced drivers, the company equips the chassis with this type, a design providing two speeds forward and reverse. The clutch, jackshaft and transmission are a unit and the latter is inclosed in an oil tight, weather and mud proof case which is provided with a large inspection plate. The clutch is of the multiple disc type, operating in a bath of lubricant and is readily accessible and easily adjusted.



Open Express Wagon Type of Body Providing Ample Carrying Capacity Behind the Drivers' Seat.

Drive from the motor to the jackshaft is by shaft, provided with a large and well designed universal joint at either end. Final drive is by double roller chain of ample dimensions and means are provided for alignment of the rear axle. The gear ratio is such that a speed of 15 miles an hour is obtained. The company, however, will fit gears to meet the working conditions of the purchaser, as all parts are interchangeable.

Rear and Front Axles.

Both front and rear axles are steel drop forgings, the former being 1.5 inches square and the rear 2.25 by 1.5 inches. The alignment of the rear member with the jackshaft is secured through two ample, tapered I beam members, which rods serve as brake hangers and anchors.

The frame is of pressed channel steel, 140.5 inches long and 34 wide. It is thoroughly braced by cross members and a tierod in front, the latter serving to retain the starting crank. The wheelbase is 94 inches.

Semi-elliptic springs are utilized both front and rear, the company stating that the type is the most logical for commercial vehicles in that they care for a heavy load transported over rough roads. The springs are constructed of a specially treated high grade steel and so secured that vibration is absorbed, yet are staunch enough to withstand severe shocks occasioned by heavy loads.

The brakes are of the internal expanding type located inside the sprockets on the rear wheels. They are operated by a pedal, and a hand lever is provided for emergency and for locking the brakes when stopping or on a steep grade. The diameter of the brakes is 10 inches and face 2.5, providing ample braking surface.

Wheels and Tires.

The wheels are of the artillery type and the hubs and hub flanges are liberal in size and designed to withstand severe service. Ball bearings of ample diameter are employed. When solid tires are fitted 36 by two-inch members are provided in front and 36 by 2.5 inches in the rear, although tires 36 by 2.5 inches front and 36 by three rear are listed as extra. Pneumatic shoes, 34 by four inches, are optional equipment.

The steering gear is of the irreversible type and the steering column is fitted with a 16-inch wheel upon

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which is mounted the throttle lever. Left hand drive is employed, with high speed and brake levers at the right in the centre. The low speed and reverse are operated by pedal. The fuel capacity is 12 gallons, sufficient for considerable service. The equipment comprises two oil side lamps, tail light, horn and tools.

In the matter of details the company has been very particular. Lock washers and cotter pins are employed throughout and lubrication of parts subject to wear has not been overlooked. Grease cups are fitted to all components and 29 of these members are disposed at convenient places on the chassis.

The company manufactures a wide variety of standard bodies to meet the requirements of different industries. The dimensions of the express and stake bodies are 80 inches long and 45 inches wide. In addition to standard bodies the company is prepared to build special types to meet the needs of the purchaser.

The Mora commercial car is covered by a liberal guarantee and the maker states that with reasonable and proper care it will withstand and give satisfactory service under a 25 per cent. overload.

ADVANTAGE OF TRAILER.

Some Suggestions Resulting from Recent Test of La-France Hydraulic Truck.

An accompanying illustration shows the LaFrance gasoline-hydraulic truck, distributed by the Hydraulic Truck Sales Company, 1777 Broadway, New York City, in a recent test in Jersey City, N. J., in which the six-ton truck was loaded with six tons and in addition hauled a trailer carrying nine tons, making a total load of 15 tons. The truck weighed 4.5 tons empty and the trailer four tons. This entire load was hauled up a 10 per cent. grade, the truck being stopped on the grade twice and started again, each time without difficulty.



LaFrance Gasoline Hydraulic Truck Hauling Trailer with Combined Load of 15 Tons.

As a result of this test and others which have been conducted of late in order to demonstrate the value of the truck and trailer combination, it is suggested that several interesting points have been brought out. In the first place it is held that the cost of operating a truck is governed by the following factors: Interest on the investment, depreciation, insurance, garage expense, chauffeur's salary, gasoline and oil and tires.

With a six-ton truck operating and carrying six tons, these may be regarded as fixed charges. But by using a six-ton truck and hauling in addition a trailer carrying nine tons, for instance, the load capacity of the equipment is increased materially. The Hydraulic Truck Sales Company suggests that the above factors are affected by this combination in the following manner:

The cost of the trailer being only about 10 per cent. of that of the truck, the items of interest and depreciation are increased only in proportion to the cost of the trailer. The insurance item is divided into two classes, fire and accident, the latter including collisions, property damage and liability. By the combination the second class is not affected at all, and the first is increased only in proportion to the cost of the trailer. The garage expenses might be doubled, since it is conceivable that a nine-ton trailer would take up as much room as a six-ton truck. The salary of the chauffeur certainly is not going to be any more. As to the cost of gasoline and oil, and tires, there is a lack of definite data, but the experiments thus far conducted would seem to indicate that this item would not be increased to a proportionate degree.

The company maintains that using a trailer will materially decrease the cost of hauling goods. It is further claimed that the hydraulic transmission utilized in these trucks affords a tremendous tractive effort and that this factor makes the LaFrance the logical truck to use for hauling trailers. It will be noted that in the test described herein the truck was not overloaded, the Hydraulic concern believing that it is poor practise and that the only proper method of increasing the load is by utilizing a trailer as outlined.

Three KisselKars, made by the Kissel Motor Car Company, Hartford, Wis., in service with the Golden Rule Department Store, St. Paul, Minn., average 47 miles a day, while one of them covers 62 to 65 miles in suburban delivery and makes more than 200 stops. The figures show a substantial saving in the cost a package for delivery, while the range of trade has been extended greatly.

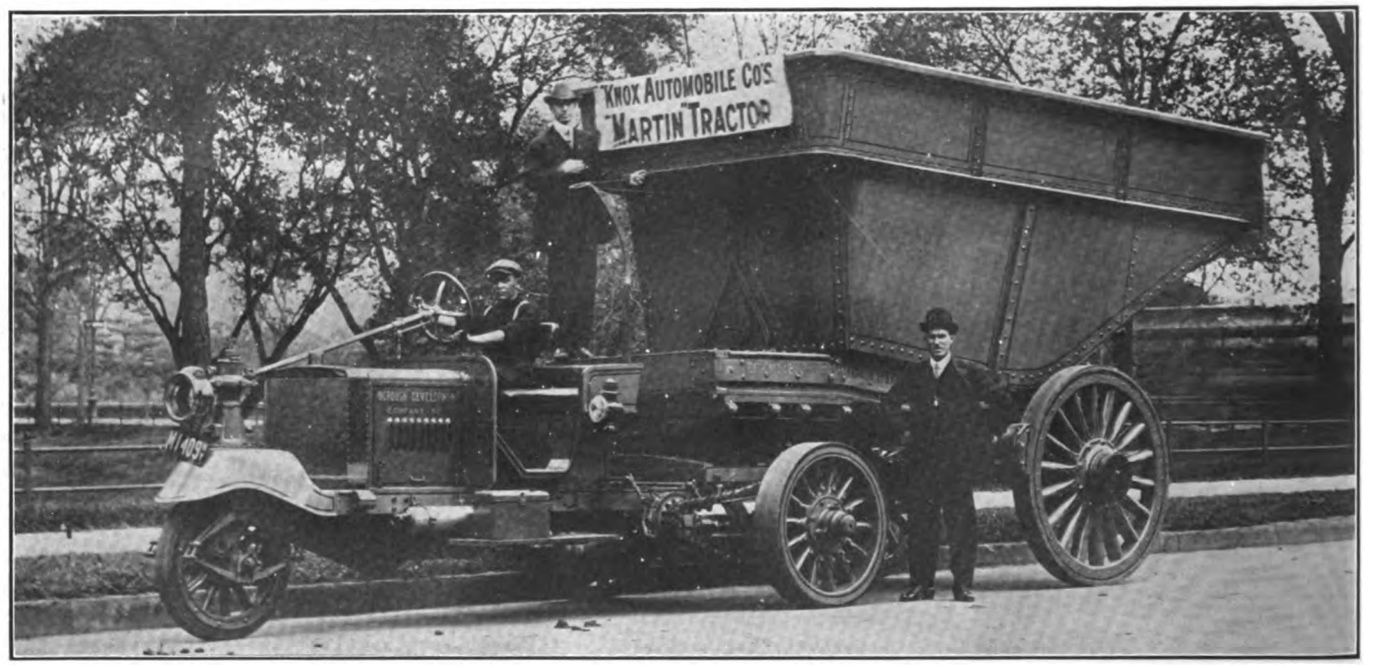
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FIFTEEN TONS AT A LOAD.

Martin Tractor Demonstrates That It Is Able to Handle Large Truck with Ease.

Herewith is presented a photograph of a 15-ton ash wagon recently designed and constructed for the Borough Development Company, Brooklyn, N. Y., which is drawn by one of the Knox Automobile Company's Martin tractors. The wagon is 12 feet in height and the combination is 26 feet long, making what is believed to be one of the largest pieces of motor equipment in the world.

The body proper is designed to take 15 tons of ashes at a load and to withstand a speed of eight miles an hour. The wheels are shod with steel tires, which will be utilized until snow makes its appearance on the ground, when the front wheels of the wagon, the driving members, will be shod with rubber for winter wear. The heavy load, however, is to be carried on steel at all times.



Martin Tractor Hauling 15-Ton Ash Wagon, a Combination Recently Constructed for the Borough Development Company, Brooklyn, N. Y.

A large number of these Martin tractors are at work in different parts of the country, some drawing from six to 12 tons of coal, lumber or other merchandise, while still others are attached to ladder trucks, water towers or steamers in fire department service. The 15-ton ash wagon is said to be the largest load one of these machines has been called upon to handle, and its success on the Brooklyn equipment is held to be indicative of its ability in the future.

A saving of about $25 a day has been made by W. G. Thomas, a Detroit contractor, by the substitution of a G. M. C. three-ton truck for horse drawn wagons. Mr. Thomas is compelled to haul brick 7.9 miles a day. He tried horses at first and found that each team could deliver but one load a day, carrying four tons at a cost of $7.50 a trip. The truck carries 25 tons of brick each day, or the equivalent of the work formerly done by six teams, with an expense of less than $20 as compared with $45 for the latter.

FIFTY MILES WITH KISSELKAR.

Covers Numerous Grades Over the Roads to the Berkshires in 12 Hours.

That the motor truck is to supersede the horse, or even the railroad, in hauling merchandise and household goods across country within a reasonable distance, is a fact which is beginning to make itself felt with those who are engaged in the general transfer business. Numerous instances of such work have been brought to light within the past few months, and in nearly every instance it has been demonstrated that the mechanical transport can accomplish the task to better advantage and at less expense than either of the other methods mentioned.

The Albany Trucking & Storage Company, Albany, N. Y., has a four-ton KisselKar truck, made by the Kissel Motor Car Company, Hartford, Wis., which it has been utilizing in transfer work for some time past. As has been true with many other transfer companies it has found the car of inestimable worth whenever it has been necessary to employ a transport for so-called long distance haulage.

Recently the concern was called upon to deliver an 8600-pound load of goods in Great Barrington, Mass., a distance of some 50 miles. The way leads over some of the most difficult hills among the Berkshires, and a large portion of the outward journey was up-grade.

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Four-Ton KisselKar Truck in Service with the Albany Trucking & Storage Company, Albany, N. Y., in General Transfer Work.

The round trip was made in a little less than 12 hours, which indicates the possibilities in quick transportation with motor vehicles.

PEERLESS IN LUMBER WORK.

Two Vehicles of This Make Supplant Several Horses in Hauling Logs to Mill.

Within the past year or two, itinerant lumber men, those who move a portable sawmill from place to place in the woods of New England and the East, have been turning their attention to the motor truck, and in several instances these vehicles have demonstrated that they may be relied upon to present figures of economy and efficiency in a field in which it might be supposed that the horses would excel. The cars are utilized not only for hauling the logs to the mill and lumber to the railroad, but in transporting the mill from one scene of operations to another.

An instance of this nature is cited in the experience of Charles H. Phillips, Plainfield, Conn., who has two Peerless trucks, made by the Peerless Motor Car Company, Cleveland, O. One of these was purchased in October, 1911. It covered 50 miles a day over the comparatively unimproved forest roads and did the work of from eight to 10 horses. The result in economy was such as to indicate the wisdom of the change and a second machine was ordered. Several very steep grades, with soft surfaces, are surmounted regularly by the trucks and without difficulty. Thus far there has been practically no repair expense, according to the information available.

Instead of cutting the tree trunks into the usual log lengths, it will be noted by an accompanying illustration that the practise is to leave them intact. Two or three such trees, with the branches trimmed off, are carried at a load. One end is placed on the truck body and the other on a pair of trailing wheels, as shown.

Garfords in Livery Service—Fifteen 40-horsepower Garford limousine cars, made by the Garford Company, Elyria, O., have been ordered by the Washington Motor Livery Company, Chicago, for immediate delivery to be put in service in that city as soon as they can be completed and shipped. This is the fourth motor livery concern of the Windy City which has adopted the Garford car exclusively for taxicab service. When the order shall have been filled there will be 125 Garford machines in Chicago's livery service, representing, it is claimed, an investment in excess of that of any other one automobile concern in Chicago.



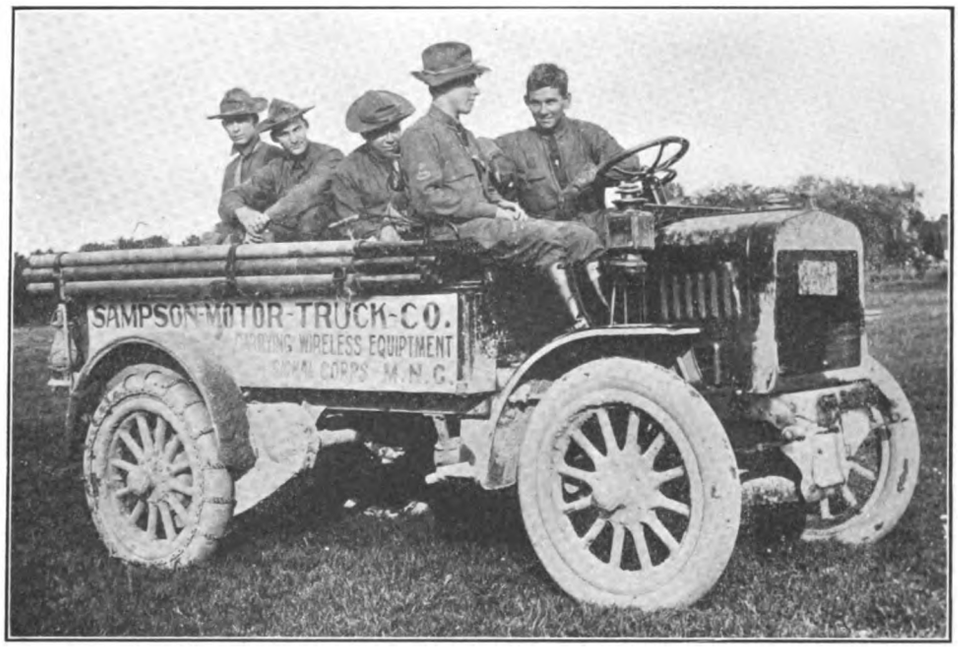
One of the Peerless Trucks with Lumber Service with Charles H. Phillips, Plainfield, Conn., Showing Method of Hauling Logs.

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THE CAR SHORTAGE PROBLEM.

Solution of the Difficulty Lies in Growers Replacing Horses with Motor Trucks.

With the increase of the use of motor trucks throughout the country in various branches of business, it is thought that much of the shortage of railroad freight cars, so pronounced at this season of the year, will be eliminated. It is surprising in view of the fact that the railroads have from year to year increased their rolling stock, that there should have been a shortage of 12,412 cars to haul the bumper crops of the West this year. Yet this was the fact and it undoubtedly was due to the slow loading and unloading of freight. Shippers, anxious to make quick collections, have sent many cars only half loaded when they might have carried full loads had the quicker method of transporting their product by motor truck been adopted instead of using horse drawn methods.



Sampson 1500-Pound Wagon, Loaded with Signal Corps, Michigan National Guard, in Recent Military Manoeuvres.

There has been much talk about the need of co-operation between railroads and shippers, but the motor truck appears to be the co-operation to relieve this traffic condition and the shortage of freight cars during the rush season. Many freight cars have been treated as a storage warehouse, being left loaded for a day or two because the shipper has not had rapid means of hauling. The commercial motor vehicle will solve this, because it can haul full loads in quick time. The ton, three-ton and heavier types of trucks will overcome all difficulties for the shippers of heavy wares. There will be an increase of business by all concerns, the railroads will get better value for their rolling stock; they will deliver more goods and the general conditions as far as getting goods to the consumer promptly, will be better. It is the co-operation of the motor truck which is the real connecting link between shipper, railroad and consumer, and the unit in giving the commercial world prompt, profitable results.

SAMPSON VS. ARMY MULE.

Light Delivery Wagon Performs Good Service with Signal Corps in Michigan.

One result of the recent manoeuvres of the Michigan National Guard, in the vicinity of Ludington, was the satisfactory service performed by a 1500-pound Sampson wagon, made by the Alden Sampson Manufacturing Company, Detroit. This car was placed at the disposal of the signal corps, and according to First Lieut. R. I. Gaudy of that command, it supplanted 10 horses and four pack mules. He adds: "At best the mobility of such a unit does not average over 20 miles a day, while the same distance is an hour's comfortable work for the section transported on the Sampson truck." His report continues:

"The machine was ready for instant use during the entire 10 days and was operated over all sorts of roads. The loose sand in the vicinity of Ludington is certainly as impassable as anything to be met with in average field service, and even across country, through untouched undergrowth, the car carried the men and equipment at the order of the signal corps officers. At no time did the officers choose favorable routes for the truck.

"To complete the test and give the officers assurance that the truck would handle itself and its load over all roads, it was packed with the entire wireless outfit and camp equipment for the use of six men, who rode, in addition to extra personal equipment for their comfort. The car was driven across country from Ludington, loaded far beyond its capacity, care being taken to put the route over the worst available roads in that general direction. The trip was made without any forced stops, whatever, and with no motor or car trouble."

Express Company Adopts Trucks—The management of the People's Express Company, which transacts business between Amesbury, Newburyport, Ipswich, Essex and Boston, Mass., has recently added four large motor trucks to the company's equipment, all of which run between those points and Boston at a saving in time of delivery and cost of operation.

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THE TIRE QUESTION.

Goodyear Company Claims to Have Solved the Problem with a New Fire Type.

According to F. H. Sawyer, head of the fire truck department of the Goodyear Tire & Rubber Company, Akron, O., the importance of marketing a suitable solid tire for motor driven fire apparatus is apparent when it is known that the interval between the sending in of an alarm and the arrival of the apparatus is the determining point in such service. He adds that the effect of vibration caused by the increased weight and speed of fire apparatus over that of the ordinary commercial vehicle, causes a big increase in wear and tear of tires—three times the speed producing approximately nine times the wear and tear, according to his figures.

As a result of his investigation the experimental department of the Goodyear Company has developed what is known as the Goodyear cushion fire truck tire, which has been used with success for some time. Briefly described this tire possesses a dual tread, thereby providing a pliable construction that is readily distorted. The sides are so molded as to produce numerous pockets, which are separated by inclined partitions or bridges, the latter acting as hinges and permitting a natural displacement of the rubber. The pockets also are held to provide the necessary space for the hinged action of the bridges and for the displacement of the rubber.

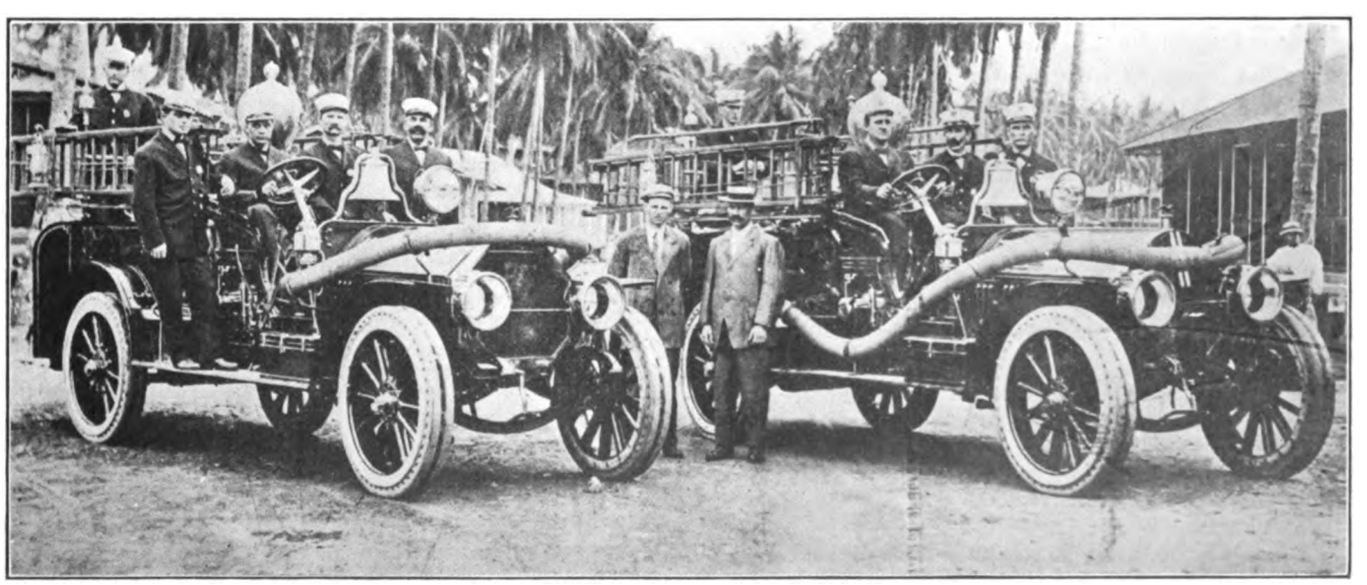
An accompanying illustration shows two Webb combination pumping engines and hose wagons, in service with the United States government in Panama. These are equipped with the new Goodyear tire and are said to have given splendid satisfaction under the peculiar conditions which exist on the isthmus.

AMBULANCE FOR BRIDGEPORT.

Every Convenience of Physician and Patient Have Been Considered in the Construction.

A private ambulance, to be at the disposal of all the officials of the city, has been purchased at Bridgeport, Conn., by James T. Rourke, former member of the board of public charities. The ambulance will be at the service of physicians night and day. The chassis is a Locomobile type L.

The body is mounted upon special springs and the interior is fitted with an ample cot and two collapsible chairs for nurse and physician. Electric lights are generously distributed both inside and out of the machine. A handy arrangement of switches places all



Two Webb Combination Chemical Wagons and Pumping Engines in Service with the United States Government in Panama, and Fitted with Goodyear Cushion Fire Truck Tires.

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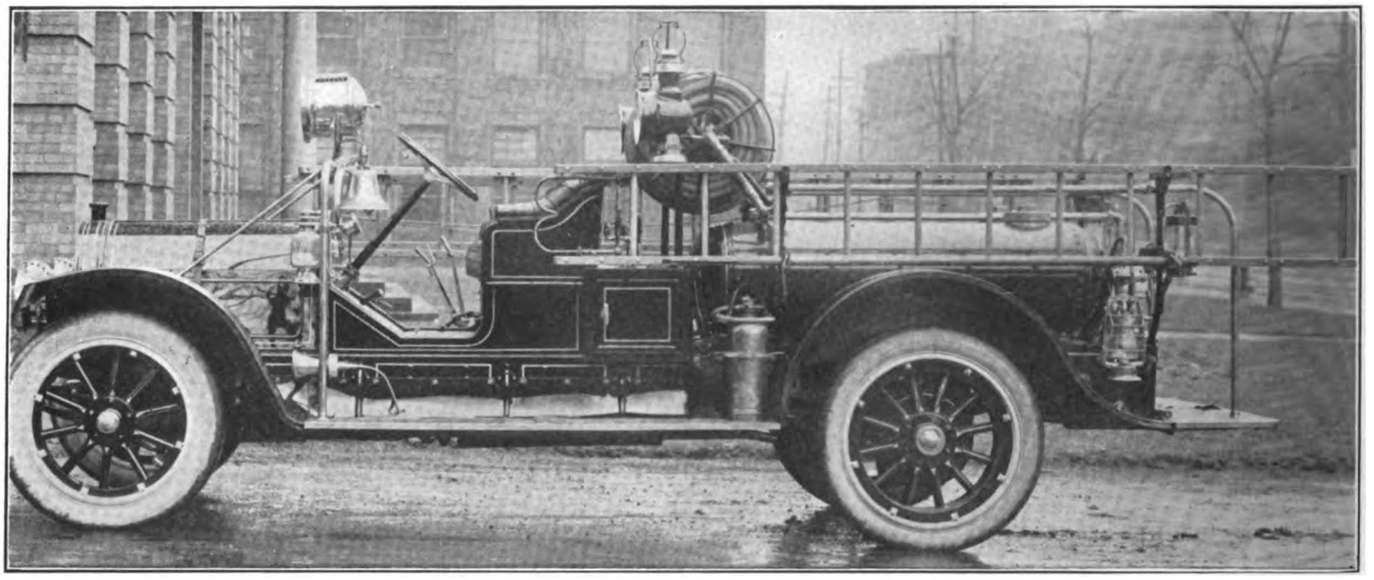
within ready control and the ambulance is a fine illustration of perfection of the automobile builder's art.

POPE-HARTFORD CHEMICAL WAGON.

Somewhat Novel Type of Fire Apparatus Constructed for Use in California.

A piece of motor driven fire apparatus which is somewhat unusual in its appointments is that which was completed recently for the department in San Francisco, by the Pope Manufacturing Company, Hartford, Conn. It is termed a chemical wagon, and carries no water hose and no squad of men. The crew is limited to those who will have charge of the two chemical tanks.

As will be noted from the accompanying illustration, the two tanks take up the whole space usually reserved for hose or men and their fire fighting equipment. Each of these is of 80 gallons capacity and they



Pope-Hartford Chemical Wagon, Made by Pope Manufacturing Company, Hartford, Conn., and Recently Installed in San Francisco, Cal.

are accompanied by 250 feet of one-inch hose. The machine is designed for quick work in rushing chemical apparatus to fires with all possible dispatch. In the preliminary test the vehicle travelled at the rate of 55 miles an hour.

EFFICIENCY OF MOTOR EQUIPMENT.

Chief Daggett of Springfield, Mass., Presents Interesting Conclusions Respecting Results Obtained.

An example of the speed, reliability and efficiency of motor driven fire apparatus is shown by the recent report of Chief W. H. Daggett of the fire department in Springfield, Mass., concerning the results obtained in that city July 4 and 5. He says in part:

"On the Fourth we had a total of 18 alarms, which were scattered all over the city, while on the 5th 12 alarms were rung in, of which half were received in rapid succession between noon and 4 in the afternoon, necessitating such rapid response on the part of the department that the apparatus on several occasions did not have time to return to the engine houses between calls.

"The total mileage for the two days' fires from the main fire headquarters was over 50 and with the thermometer hovering around the 90's on both days, one can readily imagine what would have become of Springfield if it had been dependent upon horses to pull its apparatus. Although several of the fires were situated in dangerous localities, each one was reached and put out before it had time to assume serious proportions and so promptly were they handled that no second alarm was necessary throughout the two days of strenuous work, and practically all of them were put out with chemicals without the assistance of a drop of water.

"This result, in my opinion, is a strong testimonial to the automobile fire fighting apparatus and particularly of the effectiveness of the auto-chemical on account of its great speed and ability to choke a blaze in its incipiency with the smallest possible property loss and damage."

DUSTLESS MOTOR SPRINKLER.

Street Department in St. Louis Is Testing Novel Production Fitted to Saurer Chassis.

The city of St. Louis, Mo., has begun operations with a dustless motor sprinkling apparatus, equipped with a tank of 1400 gallons capacity and mounted upon a 6.5-ton Saurer chassis, made by the International Motor Company, New York City. The nozzles are made adjustable so that the quantity of water thrown out and the distance it is thrown can be regulated by the driver to suit conditions.

The nozzles are forward of the sprinkling wagon

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instead of in the usual place in the rear. This is so that the truck itself would not cause the very evil it was designed to cure. The forward position of the spraying apparatus waters the streets in advance of the wheels, so a cloud of dust is not raised as a preliminary to the dust laying.

ONLY ONE BIDDER.

American-LaFrance Company Would Supply New York City with 28 Additional Motor Fire Engines.

In his estimate for the coming year Fire Commissioner Joseph Johnson of New York City asks for $11,299,157. Included in the expenses this amount is expected to cover are 1000 additional firemen to man 42 new stations that are to be equipped with motor driven vehicles. There are now 19 pieces of fire fighting apparatus of the automobile type and it is contemplated to add 87 more machines before next summer. The contracts for most of them already have been let.

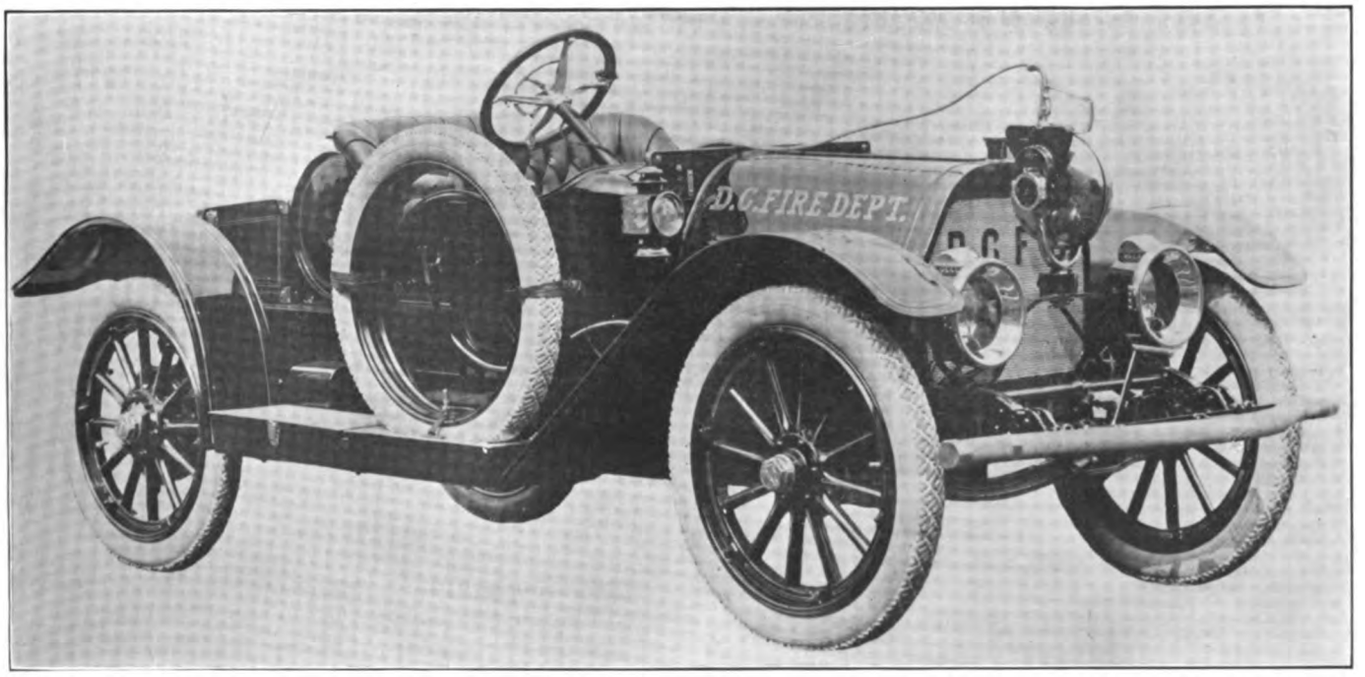
When Commissioner Johnson recently opened the bids for 28 automobile fire engines, soon to be added to the metropolitan department, he found that the American-LaFrance Fire Engine Company, Buffalo, N. Y., was the only bidder. The engines required are to have a pumping capacity of 850 gallons of water a minute and the specifications called for gasoline driven Christie tractor with steam pumping engines. The bid of the LaFrance company was $8890 per engine, 15 to be delivered in five months and the balance in eight months. Fire department officials expect that the gasoline propelled engines will prove an advantage in the districts where the runs to answer fire alarms are over a considerable distance.

WANTS FORTY VEHICLES.

New York's Street Department Asks for Appropriation for Garbage Disposal and Sprinkling.

Commissioner Edwards of the department of street cleaning in New York City is seeking a method whereby he can secure a permanent and much larger motor equipment for his department. Mr. Edwards has experimented somewhat extensively with motor driven apparatus and is much pleased with the results thus far obtained.

In his estimate for 1913, submitted to the budget committee of the city government, he requests an appropriation of $210,000 to be expended in the purchase of 40 motor trucks to be used for garbage removal and in street sprinkling. He also wants $200,000 for the installation of self-propelled street sweeping machines. The department recently received a special appropriation which is being used for the rental of a number of motor trucks for demonstration purposes. It is the purpose of Commissioner Edwards to try out a number of types of machines before making any recommendation for the purchase of a particular make of motor truck.



Forty Horsepower Warren Roadster, Converted into Chief's Wagon for Deputy Chief Sullivan of the Department in Washington, D. C.

WARREN FOR WASHINGTON DEPARTMENT.

City Also Has Its First Fully Equipped Motor Fire House Ready for Service.

An accompanying illustration shows the 40 horsepower Warren roadster, constructed especially for Deputy Chief Sullivan of the fire department in Washington, D. C., by the Warren Motor Car Company, Detroit. The machine was purchased after keen competi-

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tion among a number of manufacturers. It is finished in solid red and is equipped with a Newtone horn, an immense gong in front and an ordinary automobile horn over the radiator. On its initial test it demonstrated its ability to run 65 miles an hour.

The District of Columbia also is experiencing the novelty of having its first fully equipped motorized fire station, Chief Frank J. Wagner recently turning over to Engine Company 24 two pieces of such equipment. The house is located in the suburban section, where it is expected that the machines will show to the best advantage. Among the other new equipment of this nature is a pumping engine and combination chemical and hose wagon.

BRIEF ITEMS OF GENERAL INTEREST.

Ambulance for Washington, D. C.—A motor driven ambulance is the latest addition to the fleet of municipal machines being operated by the city of Washington, D. C. The car is being used by the emergency hospital and is the gift of a former woman resident of the Capital. It is finished in battleship gray, with bird's eye maple interior and red upholstery, and has all the latest hospital equipment.

Five More Patrols for Pittsburg—The officials of the department of public safety in Pittsburg, Penn., have contracted for five more automobile patrols. This is the second order for five machines given within a short time. Those already in service proved so satisfactory that the second order was determined upon. The first was placed in commission Aug. 1 and within three months the old horse vehicles will be a matter of past history.

Knox Water Wagon—The Springfield, Mass., water department has put into service a new three-ton Knox truck, made by the Knox Automobile Company of that city. The vehicle is equipped with a convenient type of body, suitable for hauling heavy pipes of all sizes, as well as men and tools or general supplies. The motor is rated at 40 horsepower and is expected to have ample power to negotiate all the hills encountered in its wide range of territory.

Buicks in Service in Boston—The city of Boston recently added three Buick cars for the cemetery, paving and lamp departments, the machines for these departments having big mileage capacity. At least two of the Buicks in the Boston city garages have travelled upwards of 100,000 miles, giving excellent satisfaction. At present machines of this make are used in the following city departments: Fire, street, wire, bath, park, school, light and sewer.

Two White Insurance Patrols—The fire patrol committee of the New York board of fire underwriters has placed an order with the White Company, Cleveland, O., for two additional gasoline propelled patrol cars. One is for the borough of Brooklyn and the other is for the borough of Bronx.

Schacht Combination Wagon—The city of Newport, Ky., has made the purchase of a motor hose truck of the Schacht Motor Car Company, Cincinnati. The machine is a combination hose and ladder truck and is giving daily service. So enthused are the Newport authorities over the efficiency displayed by the vehicle that they are contemplating a speedy and complete motorization of their entire fire fighting equipment.

Victor Seeks Big Order—The city council of East Liverpool, O., is considering the motorization of the fire department. C. M. Miller of the Victor Motor Truck Company, Buffalo, N. Y., submitted an estimate to equip the department with one triple combination engine, a chemical engine and hose cart, an aerial truck and the work of converting three chemical wagons to motor propelled vehicles, all 100 horsepower machines, a motor truck patrol and a special car for the chief, the latter being of 50 horsepower.

Seagrave with Tractor Device—The Seagrave Company, Columbus, O., has delivered to Chief Louis Behrens, Charleston, S. C., a motor combination chemical and hose cart, with tractor device, which has been placed in active service at the central station.

White for County Official—The commissioners of Allegheny County, Penn., have awarded a contract to the White Company, Cleveland, O., maker of the White truck, for an automobile truck to be used by the county sealer of weights and measures. The machine is to be of the wagon type and is to be used in carrying the equipment of the official in his trips about the county to test scales and measures.

American-LaFrance for South Carolina—The fire committee of the Gaffney city council, Gaffney, S. C., has awarded a contract to the American-LaFrance Fire Engine Company, Elmira, N. Y., for an automobile fire truck and hose wagon, both to be equipped with chemical engines and to be delivered by March 1.

Pumping Engine for Bridgeport—Bridgeport, Conn., has purchased a new gasoline pumping fire engine at a cost of $10,000. The engine is rated at 126 horsepower and is capable of driving the machine at a speed of 40 miles an hour.

In the Market—Following are some of the cities which are contemplating the purchase of motor driven fire apparatus: Johnstown, Penn.; Champaign, Ill.; Janesville, Wis.; Macon, Ga.; Pasadena, Cal.; Springfield, O.; Providence, R. I.; Columbus, O.; Owensboro, Ky.; Belmont, Mass.; Muscatine, Ia.; Newark, Del.; Harrisburg, Penn.; Davenport, Ia.; Fresno, Cal.; Wilmington, Del.; Wichita, Kan.; Hallettsville, Tex.; Flint, Mich.; Akron, O.; Spokane, Wash.; Norristown, Penn.; Ogdensburg, N. Y.; New Bedford, Mass.; Minneapolis, Minn.

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New Commercial Car Accessories

Hardy Spark Plug Tester.

The Hardy spark plug tester is the product of the R. E. Hardy Company, Austin avenue, Chicago. It is designed to make easy the location of a faulty plug and to protect the workman from possible shocks. The handle is of insulated material to which is fitted two metal strips which are placed in contact with the shell and terminal of the plug, and the current passes to and across an adjustable gap with which the instrument is provided.

Sypher Magnetic Lifting Tool.

The Sypher Tool Manufacturing Company, 2208 Warren street, Toledo, O., is manufacturing the Sypher magnetic lifting tool, a device for service in the garage and repair shop. It is 12 inches in length and the magnets are operated by dry cells or a storage battery. It is actuated by a press button on the handle, thus closing the circuit and but little current is consumed.

Alco Lighter.

The Alco lighter is marketed by Chas. E. Miller, 97-103 Reade street, New York City, and its design is such that it is attached easily to the base of an acetylene burner. By it the gas may be lighted by the pressing of a lever, the movement actuating friction material, causing a shower of sparks in the path of the escaping gas. The tip is the well known Alco and throughout the mechanism is sturdily constructed.

Allen Friction Wrench.

The Allen friction wrench, manufactured by the Allen Wrench & Tool Company, 4 Meadow street, Providence, R. I., is as the name implies a device operating on the friction principle and is free from springs, teeth, etc. The inventor claims that its grip is instantaneous and that its design is such that it may be employed in smaller spaces than the usual ratchet member. The wrench comes in a neat box containing sockets of different sizes, a short and long extension, screw driver, universal joint, etc.

Gun Metal Finish.

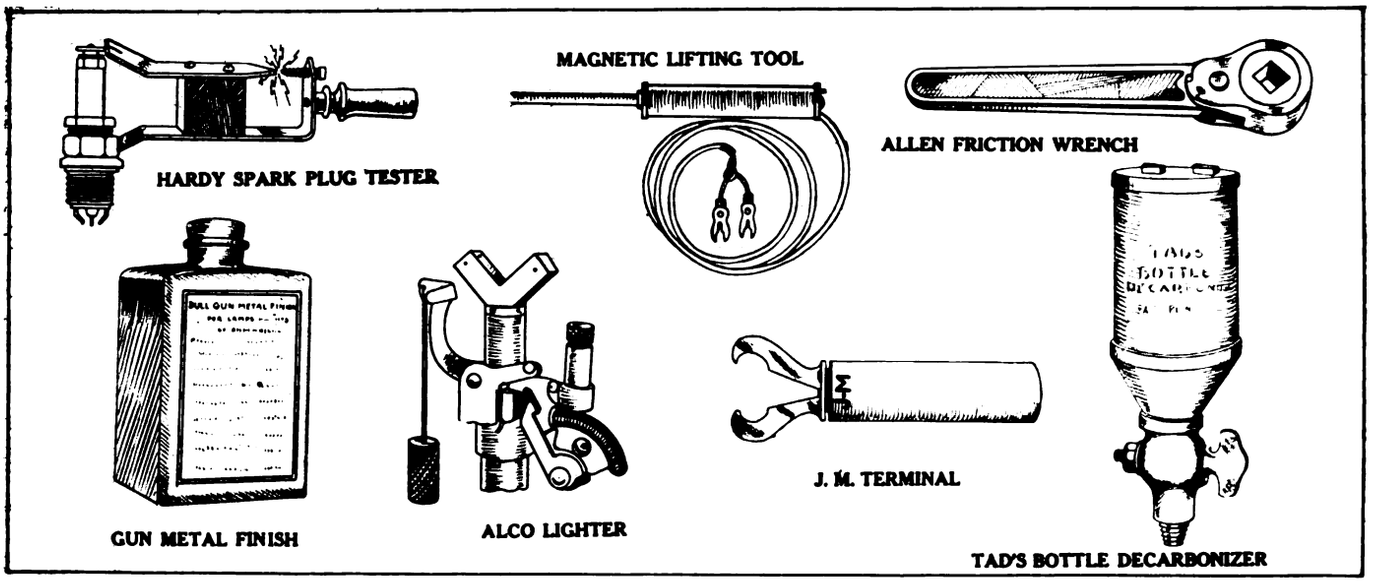
Gun metal finish is marketed by the Gun Metal Finish Company, Decatur, Ill., and is a liquid contained in a small can, employed for converting the brass or copper of the lamps, etc., into a dull finish. It is applied with a brush after the part has been thoroughly cleaned and the maker states it will dry in 30 minutes. If a gloss is desired it is secured by treating the surface with linseed oil and rubbing with a soft cloth.

Tad's Bottle Decarbonizer.

The Toledo Auto Devices Company, Toledo, O., is marketing Tad's bottle decarbonizer, which comprises a bottle shaped member for attachment in place of the spark plug on a motor and a fluid. The device is employed when the engine is running warm and the maker claims that four ounces of the material will effectually remove carbon and other deposits from the motor. The bottle is equipped with a screw adapter and a gas tight valve and is attached easily.

J-M Universal Terminal.

The J-M universal terminal is marketed by the H. W. Johns-Manville Company, New York City, and a quality of the device is that it may be employed with any type of spark plug, being secured and detached without the use of tools. It has a pair of elliptic brass jaws which are expanded and contracted by simply turning a fibre sleeve. The secondary wires are attached easily by a special construction and the maker points out accidental breaking of the threading device does not incapacitate the terminal, as proper contact can be secured through the jaws.



Illustrating Some of the More Recent Accessories Applicable to the Commercial Vehicle, Garage and Repair Shop.

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WITH THE PIERCE-ARROW IN WAR MANOEUVRES.

SOME interesting figures are revealed as a result of the trip of the five-ton Pierce-Arrow worm driven truck, made by the Pierce-Arrow Motor Car Company, Buffalo, N. Y., from that city to the recent military manoeuvres in Connecticut and return, as well as its service during those manoeuvres. Undoubtedly the greatest interest attaches to the figures for gasoline consumption, and by reference to the accompanying table it will be found that this worked out at 4.63 miles to the gallon on the outward trip, 4.42 on the homeward journey and 2.6 during the manoeuvres.

There is a slight apparent discrepancy in these figures, by reason of the fact that the gasoline listed was that put into the tank on the dates specified, and it would appear that there was at least sufficient fuel remaining upon the arrival in New Haven to take the truck to the camp at Tyler City, return to New Haven and make another journey to camp before additional fuel was taken on. This would have the effect of increasing the mileage on the outward trip, and still further reducing that made during the manoeuvres. This same situation does not appear to have existed when the homeward journey was begun.

In connection with this situation the report of the Pierce-Arrow company has the following to say: "The frequent halts, while in train formation, of course, made the gasoline consumption much higher during the actual manoeuvres than would have been the case in uninterrupted road work, or in commercial work. One fact that worked against fuel economy was that all of the road halts were of indefinite length, and the motor would be kept running until it was seen that the delay would be more than momentary. Another factor was the great amount of low gear work on sandy and bad roads, and across fields."

The performance of the Pierce-Arrow is of particular moment, because it undoubtedly is the first time that a motor vehicle has been called upon to transport army equipment such a long distance—practically 500 miles—over the road to the scene of the manoeuvres. A journey of that distance would be equivalent to a trip across the entire length or breadth of almost any European country that has been at the forefront in motor truck experimentation for military purposes.

A goodly portion of the road, both going and coming, was over state macadam, but some of the highway conditions encountered were by no means ideal. The Pierce-Arrow took them as they came, and during the actual manoeuvres back roads were used almost exclusively.

It was known before the truck left Buffalo that difficulties would be met and it was prepared for field work insofar as foresight and engineering experience could equip it. What is regarded as the most valuable of the extra equipment were the four heavy planks, 14 feet long, 12 inches wide and two inches thick. Two of these were carried on either side, and there was no day the truck was on the road that they were not used. Bad culverts were crossed by their aid, and they were laid frequently across weak bridges to distribute the strain that ordinarily would fall on a few floor boards and one set of stringers. On one occasion these boards were used by the whole army train of a dozen vehicles.



Regimental Camp Served by Five-Ton Pierce-Arrow Worm Driven Truck During Recent Military Manoeuvres in Connecticut, Indicating Character of Ground Over Which Vehicles Were Forced to Pick Their Way.

On the left side of the car a winch was mounted, connecting with the shaft running between the clutch and transmission. This was used on two occasions, but then more as a test of its adaptability than as an actual means for propulsion.

Mounted on the dash was a searchlight. This, it was expected, would be employed altogether in lighting the road for night running, but on the first day of the manoeuvres another use was found for it. During the unloading of the truck at night in the field the men had been forced at other times to work with one hand

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With the Pierce-Arrow in the Field: A, Method Employed for Protecting Bridges and Culverts; B, Right Side of Truck, Carrying Soldiers Who Preferred Riding to Hiking; C, Baggage Detail Makes Quick Work of Picking up Planks.

and arm, utilizing the other for holding a lantern. When the searchlight was turned to bear upon the load the men could use both arms for the work.

A spare wheel was carried under the rear of the body, but this was not needed, and consequently remained where it was fastened from the time the car left Buffalo until the return.

"Numerous lessons were drawn from the use of trucks in the recent manoeuvres" reads the report, "the most important of which was that the efficiency of the motor truck suffers to such an extent when compelled to travel in any army train with mule drawn wagons as to render it of little more value than its equivalent in carrying capacity in wagons. When entrained with the wagons, as was considered necessary in order to keep the entire supply train intact and under guard, the better to resist attack by the enemy, the trucks were forced to limit their speed to that of the mules. While on the road in train formation, stops were frequent, and owing to the narrow roads in the country traversed, as well as to the train formation, it was impracticable for one portion of the train to pass another. On one occasion the Pierce-Arrow was forced to stop more than 50 times in one day's march. These stops varied in length of time from a few minutes to over an hour, the whole day's travel being no greater distance than could have been covered by the truck, if its progress had been unrestricted, in two hours at the most.

"Army trucks, to be successful, must be especially equipped for their work, as was shown conclusively. Planks are an absolute necessity. In addition to those carried by the Pierce-Arrow there could have been used two others, four feet long, 12 inches wide and two inches thick for bridging short spaces.

"Among the other recommendations made by an observer were these: A winch so situated that it may be worked through snatch blocks in any direction; strong eye bolts for carrying snatch blocks for the winch line; two jacks that are quick acting and with a step that is near the ground (an even better plan is a tripod carrying a long extension lever for use in prying); a drawbar that carries an eye bolt or coupling that would prevent wear or cutting of the cable used; a swivel type searchlight; shovels and axes so placed that they are not in the way of the load but where they are accessible for instant use in no matter what position the truck may be thrown, and a double block and tackle with 100 feet of rope.

"Suggestions have been made at various times that when a number of army trucks were in train, a valuable adjunct would be an engineering truck that would carry men and tools for repairing bridges and culverts and patching up bad spots in the roads. The observers



With the Pierce-Arrow En Route: A, Road Conditions in New York State, Where It Was Possible to Make 147 Miles a Day; B, Left Side of Truck Loaded as Supply Wagon; C, One of the Narrow Roads in Connecticut.

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who were on the Pierce-Arrow, however, do not approve of this idea. They hold that each truck should carry its own equipment for meeting such emergencies. Should reliance be placed on an engineering truck, they hold, the chances are that owing to the narrow and often times conjested condition of the roads, it would not be able to reach the seat of the trouble, or if it did the delayed truck would have freed itself already."

TABLE OF TRAVEL AND OIL CONSUMPTION.

Aug.	Buffalo to	Miles	Hours	MPH	Gals. Gas	Qts. Oil	Lbs. Load
	Buffalo to New Haven.						
4	Rochester	80	8.75	9.14	20.5	..	7,776
5	Syracuse	102	14.50	7.03	24.0	6	8,000
6	Albany	147	17.50	8.40	32.0	..	8,000
7	Lee	48	8.25	5.82	5.0	1	8,000
8	New Haven	111	14.75	7.53	24.0	3	8,000
	During War Manoeuvres.						
9	Tyler City	12	....	....	....	..	8,000
10	New Haven*	23	....	....	....	..	6,000
11	New Haven*	21	....	....	13.0	2	3,000
12	Orange Center*	20	....	....	....	..	6,000
13	New Haven*	23	....	....	15.0	..	2,000
14	White Hills	32	....	....	10.0	..	11,000
15	New Haven*	38	....	....	12.0	2	2,000
16	Oxford	30	....	....	10.0	..	14,000
17	White Hills	11	....	....	17.0	..	14,000
18	Potsford*	14	....	....	....	..	5,000
19	Derby*	8	....	....	12.0	1	2,000
	White Hills to Buffalo.						
20	Springfield	79	10.00	7.90	20.0	6	6,500
21	Albany	94	11.00	8.54	12.5	..	6,500
22	Utica	97	10.25	9.40	30.5	3	6,500
23	Auburn	80	9.00	8.88	1.0	..	6,500
24	Rochester	71	8.00	8.88	18.0	..	6,500
25	Buffalo	87	8.00	10.88	19.0	3	6,500
	Totals	1228	....	....	309.5	27	....

*And return.

IMPORTANT TRUCK CONSIDERATIONS.

Record of the Product and Responsibility of the Manufacturer Factors in Making Decision.

George A. Kissel, president of the Kissel Motor Car Company, Hartford, Wis., maker of the KisselKar trucks, recently told what he considered the all-important elements to be considered in the purchase of a motor truck. "The first is the construction and record of the truck," he said, "the second is its adaptability to the particular duty required of it, the third is the permanency and responsibility of the manufacturer and the fourth is the facilities to give thorough service after the sale. Upon the construction of the truck depends its record. A truck manufacturer, who offers a good product, ought to be able to give convincing references as to its performance. Its adaptability also should be determined from these references and the additional data the manufacturer can give.

"The responsibility of the manufacturer is easily ascertained. That brings us to the question of service. Accidents may occur to trucks as well as to horse drawn vehicles and expert service should be as accessible in the one case as is the blacksmith or veterinary surgeon in the other. Service in the motor industry means prompt and skillful attention to the mechanical needs of the truck. It should be backed up with an organization that knows every nut and bolt in the truck and is equipped with the parts to insure immediate replacement."

HILL CLIMBING ABILITY.

Peerless Company Demonstrates That It Has Solved the Problem in Satisfactory Manner.

According to an official of the Peerless Motor Car Company, Cleveland, O., the secret of building a powerful truck that will carry heavy loads up steep hills or over soft roads, does not lie in equipping it with a large engine, but in arranging the weight of the truck so that there shall be ample traction and the driving wheels will never slip. "When 80 per cent. of the weight is carried on the rear axle," he said, "that lightens the load in front and makes it possible to use more flexible springs there. Jolts are dissipated and the life of the truck mechanism is lengthened.

"The Peerless truck attains astonishing power on the hills through the fact that it is designed in this way. Not long ago a prospective purchaser asked the representatives of half a dozen of the best trucks to attempt the Plumb street hill at Morristown, N. J., with their trucks under full load. The hill has a 21 per cent. grade and the surface is soft dirt. Our four-ton truck, fully loaded, went up without faltering. Seven men were added and it went up again. Then it was stopped in the middle of the hill and went on again from a standing start. The Peerless was the only truck, with one exception, that made the grade."

MORELAND ENLARGING FACTORY.

Maker of Distillate Truck Preparing to Care for Greatly Increased Business on Coast.

The Moreland Motor Truck Company, Los Angeles, Cal., maker of the Moreland distillate motor trucks, has begun an addition to its present factory in order to meet the demand of the Pacific Coast trade for its product. The trucks have steadily gained in popularity in California and the factory addition will permit of the construction of 500 trucks during the next 12 months. Besides greatly enlarging the present manufacturing space, the factory addition will also house the Moreland service department, that will give the most up-to-date service, night and day, to Moreland owners.

Twenty-six Moreland trucks were recently delivered. The product is being manufactured in sizes varying from one to five tons. On the completion of the addition to the plant practically everything used in the construction of the vehicle, with the exception of the engine, will be manufactured in the Moreland shops.

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THE SULLIVAN 1500-POUND TRUCK.

HAVING had 30 years of experience in the wholesale carriage manufacturing business, those connected with the Sullivan Motor Car Company, Rochester, N. Y., maintain that they are in a position to judge the needs of business men who require a light delivery motor vehicle. Two models are produced by this concern, one being designed for carrying loads of 1000 pounds capacity and the other, which is the newer of the two, for 1500-pound loads. The same general details of construction are carried out in both.

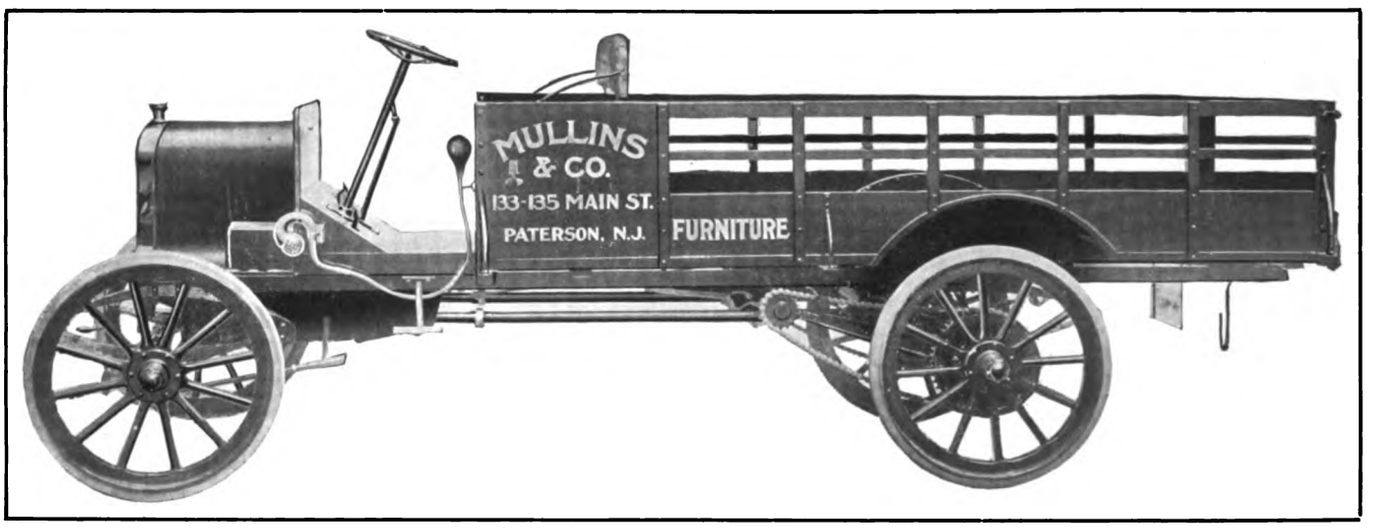
The motor is a two-cylinder, four-cycle, water-cooled unit with bore and stroke of 4.5 inches, and is rated at 18 horsepower. The cylinders are made of high grade material, carefully ground to size, and are fitted with two-inch diameter valves, made with cast iron head on steel stem. The piston and piston rings, of which there are four for each piston, are made of a specially fine grade gray iron. The wristpins are 1.0625 by 4.3125 inches, and are made of steel, case hardened and accurately ground to size. The wristpin bushing is of phosphor bronze, 1.0625 by two inches. The crankshaft is a drop forging, with front bearing 1.75 by 3.1875 inches and the rear 1.75 by 3.5 inches. The connecting rod is of steel, drop forged, and its bearing is 1.75 by 1.75 inches. All bearings are of special die cast babbitt, and all cams are ground to size and case hardened.

Ignition is by a Bosch magneto mounted on an aluminum case. The carburetor is a Schebler, with gravity feed. Lubrication is by mechanically operated oiler, which pumps oil to each cylinder, to each of the main bearings and directly to each connecting rod bearing. The valve operating mechanism is lubricated by splash. The cooling system is by thermo-syphon, which is held to be decidedly efficient, inasmuch as it has been demonstrated many times that the motor does not overheat, even when put to severe tests in hot weather and over rough roads. The radiator also is of efficient design and has developed no trouble from leaks or overheating. Cooling is still further aided by a fan located in the flywheel.

The clutch is of the cone type, equipped with a heavy spiral spring and ball thrust bearing. It has but one adjusting part and that is in sight at all times. It is claimed to be built for strength and durability, combined with simplicity. The transmission is planetary, the gears being .875 inch wide and made of the best grade carbon steel. They are box hardened and all surfaces are ground. The bearings are large in size and are made of the best bronze.

The frame of the model 51, or 1500-pound chassis, is of hot riveted angle steel, 2.5 by 2.5 by .3125 inches. The rear axle has 1.6875-inch spindles and 1.75-inch bed, and all spindles, hubs and ball bearings have been designed with an extra large factor of safety. The front axle has the same sized spindle and bed of 1.375 inches. Grease cups are provided on all wearing parts.

The front springs are full elliptic, half scroll, and the rear members full elliptic, full scroll, auxiliary cross springs being located at this point. The brakes are equalized, internal expanding on rear wheel drums, 10 by 2.5 inches. Final drive is by side chains, of one-inch pitch, .625-inch roller and .5-inch width, every link a master link. The sprockets, front and rear, are replaceable without disturbing brake drums or hubs.



Model 51, 1500-Pound Sullivan Delivery Wagon. Designed by the Sullivan Motor Car Company to Handle Light but Bulky Merchandise.

Wheels are the best second growth hickory, 12 spokes to the wheel, and fitted with hard rubber clincher tires 36 by 2.5 inches. The steering gear is of the worm and gear type, located at the left. The high gear control lever is in the centre. The low and reverse, as well as the brakes, are controlled by pedal. The wheelbase is 117 inches.

The experience of the members of the company in the wagon business is of particular value in considering the body equipment, to which the Sullivan Motor Car Company has devoted special study for the purpose of giving the purchaser opportunity to secure the utmost efficiency from his car.

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THE A B C OF MOTOR TRUCK IGNITION.

Part II--Outlining the Various Systems Utilized with the Commercial Gasoline Vehicle, Their Components and Application in Practise---Defining the Construction and Operation of Instruments Employed to Determine Conditions of Batteries.

By C. P. Shattuck.

OPERATORS of commercial vehicles propelled by the internal combustion motor should have some knowledge of electrical indicating instruments. They should know how to employ the voltmeter and ammeter, as well as the combined instrument, the volt-ammeter. They are made of the D'Arsonval and moving-iron types and in the following forms: Portable, approaching in accuracy the standard laboratory instruments, but designed to be carried about and brought to the testing bench or work; dashboard, for permanent mounting on the car, and pocket instruments. The last named are small sized, some being similar in appearance to a watch, and this type is generally employed for measuring the electromotive force, EMF, of dry cells and storage batteries utilized

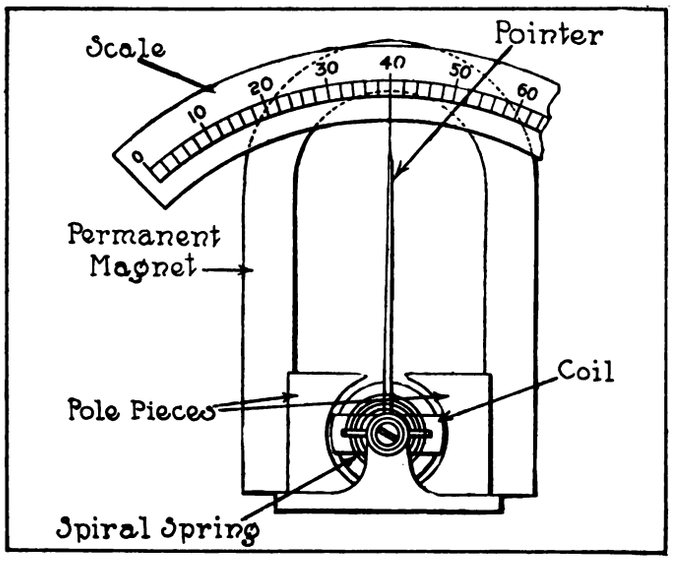


Fig. 5—Illustrating the Components of the D'Arsonval Instrument, a Current Measuring Device.

in the ignition system of the motor car, to operate electric signalling horns and to light the lamps.

Types of Instruments.

Those employed with the motor car are of two types of construction, one having a moving coil, represented by the D'Arsonval instrument, and the other equipped with a moving armature. In any design the indications are denoted by a pointer or hand, which is caused to move over a calibrated dial in accordance with the variation in electromotive force, or current strength, as the case may be, by the effect of the varying current on a magnetic field contained within the instrument. The indicating hand is securely attached to a pivoted member, termed the moving element, which the varying magnetism causes to turn or deflect against the tension of the spring.

The D'Arsonval instrument, named after its French inventor, is shown at Fig. 5, and consists of a permanent horseshoe magnet having two pole pieces located between its ends and so shaped as to be brought in proximity to each other to develop a powerful magnetic field between them. In this field is mounted a light, pivoted coil of insulated wire, to which is secured the indicating hand which projects out over the scale or dial. The coil is composed of very fine wire and carries a very small current, but the latter is proportional to the EMF, or current strength, passing through the instrument. In the commercial form of instrument a pair of light, spiral hair springs of resilient non-magnetic metal are employed to oppose the movement of the coil by a force directly proportional to the current passing through the coil, so that the pointer stands normally at zero on the dial when the instrument is not connected to a live circuit. When attached to a battery, etc., the indicator will denote the strength of the current.

The springs also serve to lead the current in and out of the coil. The movement of the coil against these members is caused by the reaction between the strong field of the permanent magnet and that due to the weak current passing through the coil, in accordance with the principle of magneto-electric induction, which causes a wire placed in a magnetic field and carrying a current to tend to move at right angles to the direction of the field.

Uniform Reading Scale.

A uniform reading scale in the D'Arsonval instrument is obtained by equalizing the retractile force of the springs, and by providing a uniform field. The former is secured by winding the springs, which are placed one above and the other below the moving coil, in right and left hand spirals. When the coil is deflected it expands one spring and at the same time contracts the other. The uniform field is obtained by proper strength of the permanent magnet, proportioning the soft iron pole pieces, and dimensions of the air gap.

The difference between the construction and operation of a voltmeter and ammeter designed on this principle is shown in the application of these members to measure the strength of an ignition battery and that of a current flowing in the primary coil circuit, these being depicted at Figs. 6 and 7 respectively. In the former the circuit goes from one binding post or connection to the other through the moving coil and a fixed resistance coil in series, the total resistance of the instrument being high.

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The instrument may be connected across the terminals of a battery or generator without danger of injury to it, provided, however, the EMF of the battery,

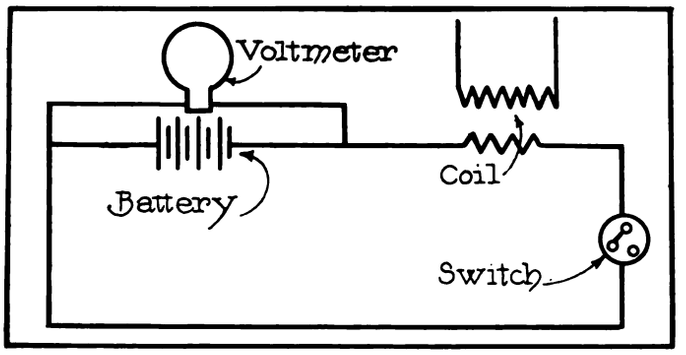


Fig. 6—Showing the Wiring Plan of a Voltmeter Employed to Ascertain Voltage of Battery or Current Generator.

for instance, is not greater than that of the instrument. Since the current which passes through the instrument is strictly proportional to the EMF of the battery or other source of electricity, the instrument is calibrated in volts.

Wiring for Ammeter.

The ammeter, shown at Fig. 7, is connected in the circuit, and the entire current passes through it. In the instrument itself practically all of the electricity goes from one terminal to the other through a bar of resistance metal, in which occurs a small but definite fall of potential equal to the product of the current and the resistance of the bar, in accordance with Ohm's law. The moving coil is secured to the ends of the bar, which is called the shunt, because it shunts or diverts from the moving coil most of the current passing through the instrument, which is calibrated in amperes.

Portable ammeters and voltmeters are sometimes constructed with two and three scales on the same scale arc, the number corresponding to the additional windings in the instrument and terminating in extra binding posts. A two-scale voltmeter employed for both electric and gasoline cars may have one scale reading from zero to 150 volts, and another reading from zero to 15 volts. The former is utilized in measuring the EMF in charging the battery of an electric vehicle while the latter gives greater accuracy of readings when testing single cells or ignition batteries. Dashboard instruments of the D'Arsonval type are constructed on the two-in-one plan; that is, a voltmeter and ammeter are mounted side by side in the same case.

Dead-Beat Action.

Instruments constructed upon the D'Arsonval principle are made dead-beat by the use of the phenomenon of the so-called eddy, or Faucault, currents. A dead-beat pointer is one that comes promptly to rest at the proper point on the scale, when the circuit to the instrument is closed, without moving back and forth.

The moving coil is wound upon a light frame of high conductivity metal and encloses a soft iron cylinder, secured to the instrument base co-axially with the coil and permanent magnet pole pieces, in such manner that a strong magnetic field is developed with only a small air gap, the latter comprising the clearance in which the coil frames may move.

Eddy currents are developed in a conductor when it is moved in a magnetic field, and the generation of these currents absorbs power, which tends to check the movement of the conductor. In this manner the metal frame in the field is quickly checked in its movement when the instrument is connected up to a live circuit, and the pointer stops quickly when it reaches its proper place, very much as if it had experienced mechanical resistance.

Pocket or Small Instruments.

Voltmeters and ammeters, as well as the combination instruments employed for testing dry cells and storage batteries utilized in the ignition system of the automobile, are calibrated to give readings of from zero to eight or 10 volts and from zero to 30 in amperes. There is also another type of ammeter having fine divisions for reading the current utilized by a coil, the operation of which will be explained in logical sequence.

In voltmeters and ammeters of the so-called pocket or watch type, the moving element to which the indicating hand is secured consists of a simple armature or vane of soft iron. This armature is supported on pivot bearings in a magnetic field. In one class of these instruments a fixed voltmeter or ammeter coil, having a fine or coarse wire winding, is mounted so as to set up a magnetic field at right angles to the permanent magnetic field, and the armature is caused to deflect by the variation in the strength of the coil's field, this being brought about by variation in the EMF or current strength in the circuit to which the instrument is connected.

A pocket ammeter complete, and with cover, dial and pointer removed, is shown at Fig. 8, A and B, respectively. It will be noted that a soft iron vane is provided to which the pointer is attached and which swings on pivots in the U shaped brass strip. The pointer is normally held in the zero position by the field of the horseshoe magnet. The ammeter coil comprises a number of turns of coarse wire wound over a straight core of soft iron at right angles to the main

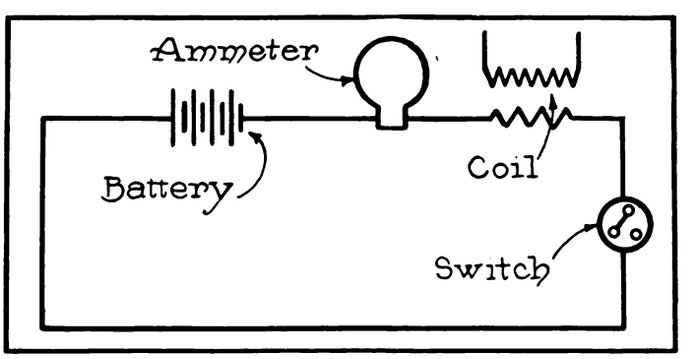


Fig. 7—Wiring Plan of Ammeter Connected in the Circuit in Series.

field. The magnetic flux due to the current passing through the coil distorts the main field, causing the vane and its attached pointer to take up a new posi-

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tion deflected from zero and through an arc approximately proportional to the strength of the current.

In some makes of small instruments quick reading ability is sought by making the moving element as small and light as possible, while in others, an air vane is employed with the moving element to check the movement of the indicating hand. The binding posts or terminals are made pointed and cup shaped, to facilitate making contact with the terminals of the battery by simply touching one instrument binding post on one battery member and using a short flexible cord connection from the other terminal of the measuring device to the other post of the battery.

Combined Instruments.

In the combined instruments, which make it possible to read volts and amperes separately, the flexible cord is secured to the top of the instrument and with some is of the removable type. The lower portion of the case or housing is fitted with two terminals and these are marked A and V, denoting volts and amperes, respectively, as illustrated by the instrument shown at Fig. 9 B and C.

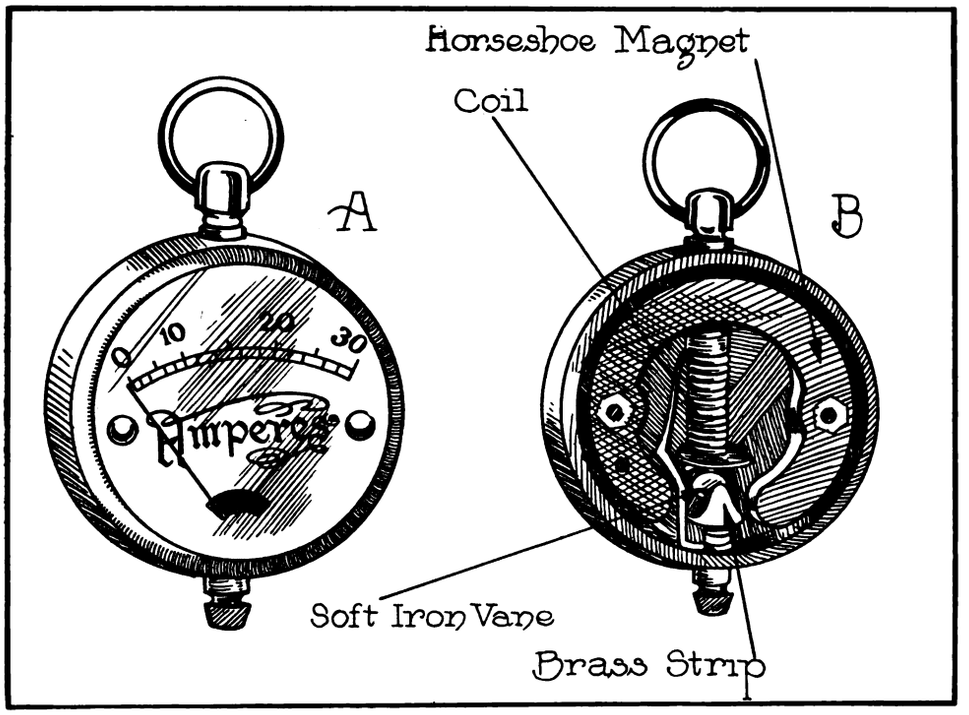


Fig. 8—Conventional Type of Pocket Ammeter: A, the Calibrated Scale and Indicating Hand; B, Components of Instrument.

When it is desired to ascertain the condition of a dry cell, and an ammeter is employed, the lower terminal is placed in contact with the positive or carbon element and the cord terminal touched to the negative or zinc terminal. In reading single cells, which is the proper method when testing a number of ignition members wired together for ignition purposes, the ammeter may be employed as depicted at Fig. 9 A. Here the lower post is in contact with the positive or carbon element and the metal case of the instrument is touching the zinc post. As shown in the sketch the pointer registers about 17 amperes, denoting that the cell is in good condition.

The combined instrument is favored by many as by it both dry cells and storage batteries may be tested. At C is outlined the method of employing the member when reading of a dry cell is desired. The post of the instrument marked A is held in contact with the carbon element of the battery while the metal end of the flexible cord is touched to the zinc post. In testing dry cells readings for amperage are usually taken, although volts may be read if desired.

At B is shown the combined instrument being employed for reading the voltage of a storage battery. The connections are made in the same manner as with the dry cell with the exception that the V post of the instrument is employed. It will be noted that the instrument is provided with a double scale, the upper figures indicating amperes while the lower shows the volts. In the illustration the pointer is resting at six, denoting that the battery is in good condition and ready for service. The ammeter should be used only to test individual dry cells and it denotes the condition of the cell at the moment the reading is taken. It does not demonstrate that one cell will last longer than another under the same condition of service although both members may give exactly the same reading in amperes. High amperage is not always an indication that the cell will give long service, for the reasons given in the previous installment. Personally the writer favors a dry cell of standard design, which has an initial amperage of from 15 to 22, than one whose amperage is considerably higher. When dry cells register less than seven or eight amperes, it is best to discard them, and when one cell shows this amperage in a set of others registering approximately maximum amperage, it should be set aside, as it will affect the efficiency of the group. It is advisable to have cells of a set as nearly uniform as possible.

Dry cells should never be short circuited. A short circuit is formed by placing some piece of metal with no great amount of resistance in it across the terminals; that is, the positive and negative poles. This causes a large amount of current to flow through the conductor and to generate hydrogen faster than the manganese can take it up, with the result that polarization follows.

Care of Cells.

Dry cells should not be placed where they are subjected either to heat or a considerable vibration, as the former dries out the moisture in the electrolyte, while vibration tends to loosen the filling compound and car-

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bon, affecting the contacts and decreasing the efficiency of the cell. In connecting a number of cells care should be taken to see that the proper poles are wired together, as an error may result in a short circuit in several members. In installing cells they should be so placed that the zinc shells or terminals do not come in contact with one another, or with any piece of metal, such as the battery box. Careless installation of cells, especially placing them loosely in the battery box, etc., is responsible for inefficiency as well as broken terminals. When properly wired and installed dry cells give good service and require no attention other than testing.

Testing Storage Batteries.

The voltmeter is employed for testing storage batteries and the ammeter should never be utilized for this work even on a single cell as the current is too strong for it and the instrument is liable to be ruined. Unlike the dry cell the condition of a storage battery is best ascertained by the use of the voltmeter. A charged cell on an open circuit may read 2.2 volts and on a closed circuit it should read two volts. With a three-cell battery, which is generally used in ignition work, the total voltage should be about six. Storage batteries should not be employed in service when readings show a cell below 1.7 volts.

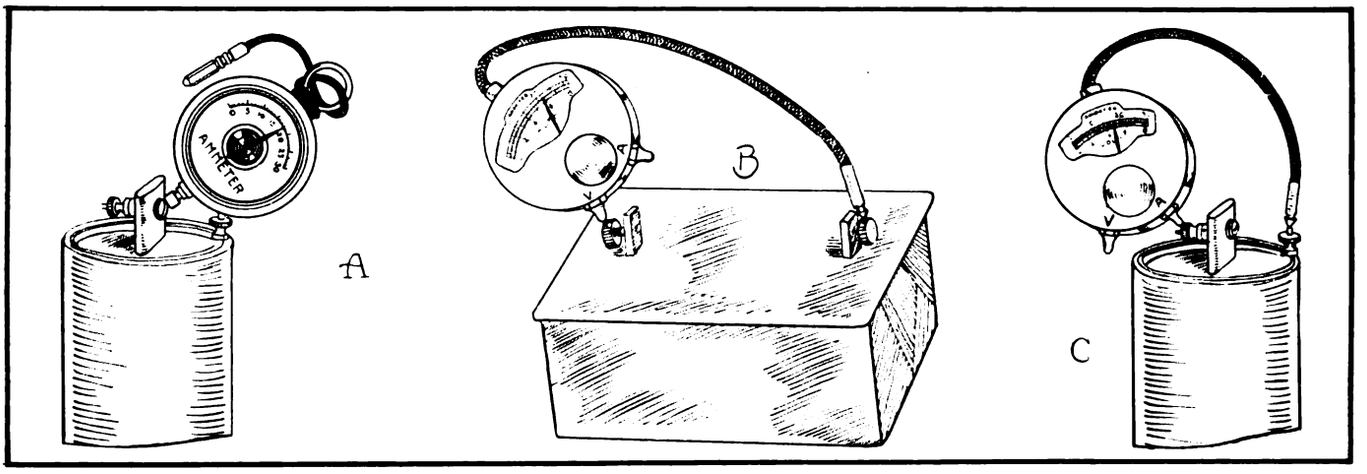


Fig. 9—Showing How Voltmeters and Ammeters Are Employed: A, Reading Dry Cell with Ammeter; B, Ascertaining Condition of Storage Battery with Voltmeter; C, Showing Utilization of Combined Instrument with Dry Cell.

The battery should never be short circuited. Some drivers have a habit of attempting to test it by placing a pair of pliers or a screw driver across the terminals and guessing at the condition of the battery by the sparks given off. This is poor practise as it causes a sudden rush of current of such strength that it would exhaust the capacity of the cells in a very short time. It also causes a sudden rise in temperature and expansion of the plates. The charging and care of storage batteries will be taken up in logical sequence.

(To Be Continued.)

Ed. Note—The next installment will deal with conductors, explaining the utilization of primary and secondary wires, also outlining the transforming of a low-tension current into high by means of an induction coil. The function of the timer and distributor employed with the battery and coil system will also be explained.

HORSES IN KANSAS.

Mechanical Transports and Agricultural Implements Rapidly Replacing Older Methods on the Farm.

Word comes from Kansas that the faithful horse has been displaced rapidly the past few years by the automobile and traction engine. In one year Kansas lost 18,582 horses and in four years 67,000. In the same period the state has gained 16,000 motor cars and 1700 traction engines for farm work. The big loss in the number of horses is principally in the wheat country in central and western Kansas, where the farms range from 300 acres up.

Most of the motor cars bought in Kansas go to the farms. Out of 18,625 machines listed, 10,784 are owned by the rural inhabitants of the state. Around Topeka there are 70 farm trucks in constant operation. In western Kansas big farms which formerly maintained 40 to 50 horses, now have scarcely half a dozen. The work is done by traction engines and a few horses perform the light work which would be unprofitable for big engines to do. Two men can handle the gasoline tractor and look after the plows while the engine turns over 30 acres of ground a day at an actual expense of 40 cents an acre. The average cost of ploughing with horses is 75 cents an acre, so that the big saving comes in the number of men needed to handle the plows.

Four Gramm Models—Four standard models with carrying capacities of one, two, three and five tons, constitute the line of Gramm trucks being constructed by the Gramm Motor Truck Company, Lima, O. As long overhangs are considered undesirable in truck construction, this fact was taken into consideration in designing the Gramm, the models of which follow the same lines in general, the chief difference between the types being in dimensions. The two, three and five-ton trucks have the distinctive Gramm features which include a four-cylinder, vertical, water-cooled motor, high-tension magneto, etc.

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FOREIGN TRUCK NOTES OF INTEREST

BRITISH ARMY SUBSIDIES.

Something Concerning Conditions Governing Grant to Vehicles Suitable for War Purposes.

In view of the part played by motor trucks in the recent military manoeuvres in this country it will prove of interest to consider the conditions adopted by the British army, governing the subsidies to be paid owners of trucks enrolled for purchase in the event of war. And in this connection it will be noted that these follow somewhat closely the unofficial recommendations made as a result of the tests conducted in America.

For instance, the carrying capacity must be of two classes—a useful load of three tons and of 1.5 tons.



Lacre Special Colonial Type Two-Ton Truck Produced for Export to the Argentine Republic.

The weight of the body is not included under the head of useful load. The larger car has weight allowance as follows: Useful load, three tons; three men on driver's seat, 600 pounds; kit, including spare gasoline tins, 200 pounds; heaviest body to be used, 1900 pounds; cab, 300 pounds. For the lighter vehicles the items are: Useful load, 3000 pounds; three men on driver's seat, 600; kit, etc., 200 pounds; heaviest body to be used, including cab, 1700 pounds. This gives the total weight of chassis as 8100 pounds for the larger car and 5500 for the smaller, with a gross weight not exceeding 14,100 and 10,000 pounds, respectively.

It is pointed out that the main object of the conditions is to make the manipulation and control of all vehicles the same, and to minimize the number of spare parts which must be carried in the field, having regard to the number of different makes of vehicles of which the transport columns of the army would be composed. The engines in both classes must be of the vertical four-cylinder type, utilizing gasoline up to 760 specific gravity. The minimum cylinder bore must be 4.5 inches for the larger class and four for the smaller.

Cylinders must be cast in pairs, all inlet and exhaust valves to be mechanically operated. Valve stems are to be enclosed by dust tight covers, which must be so designed that they are readily removable, and so that the accessibility of the valves and cylinder bolts is not affected. Inspection doors of ample size must be provided in accessible positions at the sides of the crankcase, so as to make the big end bearings thoroughly accessible for examination, etc.

Engines must be under a bonnet, which is entirely removable. Vehicle with motors under the driver's seat will not be accepted. All connections for throttle, governor, ignition, etc., must be by means of rods, not wire. All engines must be provided with governors, which are to be set so as to prevent the motor speed from exceeding 1000 revolutions a minute.

Ignition must be high-tension magneto. In order to enable the timing of the ignition to be set readily, the flywheel is to be clearly marked to a fixed pointer with stamped directions. Leads to the different cylinders should be of different colors. All lubrication must be by positively driven pump.

Both classes of vehicles are to be fitted with transmissions affording four speeds forward and reverse. The final transmission of power to the rear wheels is to be by means of a live axle in which a bevel drive of approved design should be employed. Chain drive to hind axle will not be permitted.

Several other features are specified, the list totalling 51 items. Vehicles accepted for enrollment will receive a subsidy of £110, payable in six semi-annual installments, in arrears. The trucks are not permitted to leave the country without special permission of the war office, and must be inspected at stated intervals to determine that they are properly maintained.

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LACRES IN SOUTH AMERICA.

English Concern Takes Advantage of Splendid Opening Afforded in Argentine Republic.

The Argentine republic promises to offer a good market for commercial vehicles in the near future, and this holds true particularly in the vicinity of Buenos Ayres, where considerable good roads construction has been under way during the past year. Foreign countries have taken advantage of the opportunity afforded and among the manufacturers who have placed cars of this type is the Lacre Motor Car Company, Ltd., Letchworth, England.

An accompanying illustration shows one of the four-ton Lacre special colonial type trucks recently delivered in Buenos Ayres. It has a four-cylinder, water-cooled motor, rated at 38 horsepower and equipped with a governor limiting the speed of the engine to 1000 revolutions a minute. Ignition is by high-tension magneto, with provision for easy removal of the plugs. Another feature is the possibility of fitting a duplicate high-tension magneto and separate set of plugs.

The clutch is a cone member faced with leather and of large dimensions. Power from the engine to the four-speed transmission is through a special form of spring drive, which is claimed to take up all road shocks. Final drive is by roller chains. Two independent double-acting brakes are fitted, both being supplied with cast iron shoes which can be renewed readily.

Practically the only difference between this model and and the standard product sold in Great Britain is to be found in the matter of ground clearance and in the use of a special arrangement for cooling. It is maintained that this idea of providing against excessive heat is still further carried out in the construction of the body and top. The vehicle is similar in every respect to those which have seen considerable service in Australia, and for which a number of repeat orders have been filled during the past year.

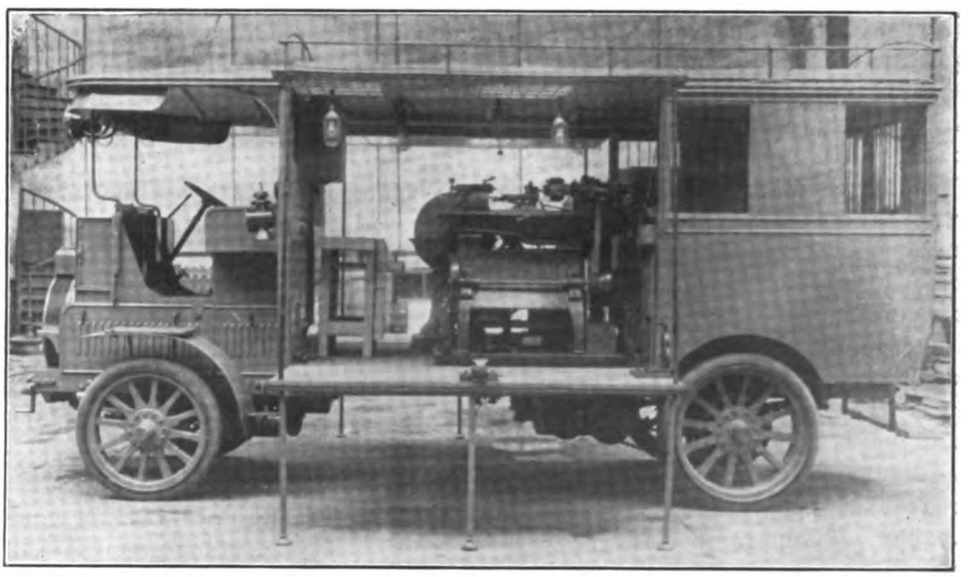
COMPETING WITH RAILROADS.

British Firm Presents Attractive Proposition for Delivering Goods by Time Table.

Until very recently the people of Great Britain were not greatly impressed with the possibilities for utilizing motor trucks in competing with railroads. Several business men had never considered the proposition until a strike compelled them to adopt such means temporarily. It is somewhat surprising, therefore, to find that a London firm, The Inter-Transport Company, has been organized for the purpose of operating a delivery system, under a specified schedule, from London, Manchester, Glasgow, Birmingham, Dublin, and other cities.

The plan was put into execution in July and hardly can be said to have demonstrated its thorough practicability as yet. However, the officials claim they will be compelled to increase their equipment materially this month, and expect to more than double it by the end of the year. The scheme is even broader than anything that has been attempted in America to date.

Eight five-ton Berna trucks and trailers are being operated in London, which is the only city in which the plan has been tried as yet. Each combination is capable of hauling 10 tons, and it is anticipated that they will be able to maintain a specified schedule, arriving and departing from certain stations according to time table. The development of its plan will be watched with interest, both in this country and abroad.



Camion Travelling Workshop Recently Purchased by the French Government for Army Field Work.

TRAVELLING MACHINE SHOP.

French Army Acquires Novel Equipment for Making Repairs While in the Field.

An accompanying illustration presents the new Camion travelling workshop, which was purchased recently by the French government, for use by the army while in the field. As outlined, the equipment is adapted particularly for use by the aviation corps, although its nature is such that it may be utilized quite as advantageously in connection with the motor vehicles in the army, or for other repair work which may appear necessary.

The illustration shows the vehicle ready to take the

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field. When a stop is made, both sides are let down upon specially constructed standards. The interior equipment includes a lathe, grindstone, carpenter's shop, vises, etc., all operated by electric energy, supplied by the vehicle motor. It is maintained that with this machine it is possible to undertake all manner of repairs.

NEW ENGLISH CONCERN.

Amalgamation of Two Well Known Companies Will Result in Production of Extensive Line.

British Business Motors, Ltd., Coventry, Eng., is a new commercial vehicle manufacturing concern which promises to make itself felt in its particular field. The company has acquired the motor manufacturing business previously carried on at Coventry as the Sturmey Motors, Ltd., together with the latter's Lotis works, and also the adjoining plant recently owned by the Hewer Car Bodies, Ltd. In addition to these properties there are several acres of land adjacent thereto.

F. G. Burford is the managing director with a considerable share in the stock of the concern and associated with him as co-directors are S. F. Edge and H. T. Vane, general manager of S. F. Edge, Ltd. The output of the company will include models from one to five tons capacity, to be known as the Cunard business motors. New shops to cover the unoccupied land are being constructed rapidly. Mr. Burford brings to the firm a unique experience. He is a pioneer of the commercial vehicle industry in Great Britain, having introduced those vehicles to the Great Western Railway, London & Northwestern Railway, Great North of Scotland Railway, Great Eastern Railway, Lancashire & Yorkshire Railway and practically all the leading London omnibus companies.

TWO FOREIGN OPPORTUNITIES.

American Consulates Can Place Agencies with Dealers in Europe and the Far East.

According to bulletin 9270 issued by the government bureau of foreign and domestic commerce, Washington, D. C., a leading dealer in automobiles and accessories in a European city informs an American consulate that he desires to receive from American manufacturers of trucks immediate offers of machines of two and three tons capacity. Prices in excess of $2500 cannot be considered or offers which do not carry with them exclusive agency rights for the country. Correspondence is invited, in English, and catalogues and drawings should be accompanied by all necessary technical information.

A business man in the Far East informs an American consulate that he desires to secure illustrated catalogues with price lists and discounts, gross and net shipping weights, capacity and horsepower of motor trucks for hauling goods from railway stations and steamboat landings to various parts of a certain city. The trucks must be of heavy construction and the wheels fitted with non-skidding solid tires, as the streets and roads are very rough. In winter they are frozen and in summer the mud is deep in places. Extra copies of catalogues should be sent to the consulate for filing. Inquiries may be made to the bureau of foreign and domestic commerce, mentioning bulletin No. 9520.

MORE POSTAL AUTOMOBILES.

London Authorities Add Seventy Machines After Successful Test of Those Already in Service.

The London postal authorities have ordered 70 new motor mail wagons to convey letters and parcels between the central and district offices and railway stations. The vehicles will carry one ton each and will increase the motor fleet of the London general post-office to about 100 machines.

The postal officials believe that this aggregation of motor vehicles will prove of great value and would be of considerable advantage in the event of a continued railway strike, as many of the wagons could be used for the collection and distribution of letters and parcels in places even at a considerable distance from London.

GENERAL NEWS FROM ABROAD.

Fire Exhibit in Ontario—In connection with the recent fourth annual convention of the Provincial Association of Fire Chiefs for the Province of Ontario, at Woodstock, Ont., it was arranged to have an exhibition of tools and equipment used in modern fire extinguishing practise. No charge was made for space and special time from the convention business was allotted for the demonstration of exhibits. Interest in motor driven apparatus was keen and the exhibition may result in its adoption in several Canadian cities and towns.

Motor 'Buses in India—The motor 'bus has penetrated into India and judging by reports of big dividends which the pioneer company is earning, it has appeared to stay. Regular service is now being maintained between Butterworth and Permatang-Bendahari, and between Bukit Mertajahm and Kulim, in Wellesley province, Penang, in the western part of the Malay peninsula.

British Museum Buys Horse Vehicles—The British museum, that vast repository of the ancient and curious, is taking time by the forelock and has purchased a horse drawn hansom cab. This is to be preserved with other ancient vehicles of which the museum has a large collection. The purchase was made in order to preserve at least one of a type of vehicle which is now growing extinct because of the advent

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of the automobile. Beside the cab, arrangements have been made to purchase two other horse vehicles. This action by the British museum affords small comfort to those who maintain that the horse is holding his own.

Fire Apparatus in Russia—There is a splendid opening in Russia for the supply of motor fire apparatus. This vast empire is only just awakening to the necessity of adequate municipal service of all kinds in other than the few principal cities. A majority of the buildings are of wood and as yet there is only one piece of motor fire fighting apparatus in entire northern Russia. This is located at St. Petersburg and was purchased under protest, with a view of selling it after its delivery. However, it has given such a good account of itself that the advisability of purchasing more when the necessary appropriation can be passed is under consideration.

Edinburgh Wants Motor Engines—Firemaster Pordage of Edinburgh, Scotland, has furnished particulars of the need of his brigade's requirements in motor apparatus, which include three gasoline motor fire engines with plunger type pumps and two 50 horsepower gasoline motor chassis for use as fire tenders.

American Trucks in Guatemala—The government of the Guatemalan republic recently purchased four American automobiles for its army. The cars were each equipped with a field piece and two of them were also fitted with wireless apparatus.

Taxicabs in War Manoeuvres—During the early fall there were 500 fewer taxicabs in use in London than under ordinary circumstances. The war office commissioned the vehicles for use during the autumn army manoeuvres. The cabs were transformed into transport wagons. The scarcity of cavalry horses in the British army made the innovation necessary and demonstrated the impromptu efficiency of the motor vehicle in case of emergency.

Want Motor Driven Plows—An importer and commission agent in a European country informs an American consulate that several of his clients desire prices and specifications of motor driven plows. He adds that large numbers can be sold in his country, which is largely agricultural. What is desired is a light motor plow with two or three shares. The consulate would be glad to receive additional catalogues and price lists of all kinds of machinery, especially agricultural, as there is constant demand for them. Particulars can be obtained by addressing the bureau of foreign and domestic commerce, referring to bulletin No. 9510.

Police Vehicles in Canada—The police commissioners of Toronto, Can., are strongly urging the purchase of motor driven apparatus for the police department, in which there are none at present. The fire department has been equipped with a few motor vehicles and the innovation has been a decided success. It is thought probable that next year the police department will be equipped with at least two motor ambulances and two motor patrol wagons. The detective department may also secure a fast motor car for special work.

Duty Removed from Motor Vehicles—For a period of six months, dating from Aug. 1, motor vehicles, other than private cars, will be imported free of import duty into San Salvador.

Possibilities in Mexico—No automobiles are made in Mexico, every machine used in that country being imported. The City of Mexico is the distributing centre for the principal mining districts. All the streets are asphalted and most of the streets leading out of the city are macadamized.

Italy Orders 100 Motor Trucks—The Italian war department has ordered another hundred motor trucks. It is uncertain whether or not these are intended for use in Tripoli. They will be equipped with Michelin tires. Earlier in the year Italy sent to Tripoli a large train of Michelin equipped motor vehicles, which were used successfully for transport of provisions and ammunition.

Transport Service in Assam—The government of Assam has recently inaugurated a service of motor transport vehicles for goods and passengers between Gauhati and Shillong.

Motors Available for German Army—Under the German subsidies system it appears that there is now a total of 70,600 motor vehicles available for army service, including 20,500 motorcycles, 23,000 private cars, 20,000 tradesmen's vans and 7100 omnibuses and motor trucks. This is an increase over the previous year of 7.84 per cent., chiefly in tradesmen's vans.

Trucks Supplanting Nigerian Natives—Finding that in the dry season one motor truck can do the work of many hundreds of natives, the shareholders of the Rayfield (Nigeria) Tin Fields, Ltd., have authorized the company to send out four motor wagons to transport its product to the seaboard. In the past the company employed thousands of natives carrying headloads, and later at Rahamma, the terminus of the Bauchi railway, 1200 donkeys were put in service. It is probable that in the near future all the work of transportation, at least during the dry season, will be done by motor trucks.

Russian Trials Attract French—A number of French manufacturers have entered cars for the Russian war office trials and these machines are now performing their work, which will continue until the end of the month. The French machines taking part are: Saurer, De Dion-Bouton, La Buire, Renault, Delahaye, Latil, Bayard-Clement, Berliet and Schneider. The Russian requirements are vehicles having a load capacity of 1.5 and three tons. It is understood that the vehicles that satisfy the army conditions will be purchased outright and that the route to be followed will be St. Petersburg, Novgorod, Krestzy, Moscow, Cladimir and return to St. Petersburg.

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E. E. Guston, formerly with the Studebaker Corporation, has accepted a position with the Velie Chicago Branch.

The Service Motor Truck Company, Camden, N. J., has been incorporated for $50,000 by R. L. Smith, C. D. Hackett and E. J. Eldridge.

The Ex-Col Motor Truck Company has been incorporated in Jamesburg, N. J., for $50,000 by T. C. Corwin, A. Englehart and A. K. Kelley.

M. R. Paige, formerly sales manager of the Moline Wagon Company, Moline, Ill., has joined the sales force of the Velie Boston Branch.

Thornton Newsum of Memphis, Tenn., has opened a branch office and salesroom for the product of the United States Tire Company, New York City.

The Cole Motor Car Company of Georgia, Atlanta, Ga., has taken the agency for Federal trucks, made by the Federal Motor Truck Company, Detroit.

The A. W. Hall Automobile Company has been organized in Cleveland, O., to handle the Hatfield truck, made by the Hatfield Company, Elmira, N. Y.

W. H. Atkinson of the Windermere garage, Cleveland, O., has taken the agency for the Sanford truck, made by the Sanford-Herbert Company, Syracuse, N. Y.

The Madison Motor 'Bus Company has been incorporated in Madison, Wis., with capital of $5000. The incorporators include Fred W. Coombe, Paul Kney and Harry J. Parker.

Fife & Miller, Dallas, Tex., has closed a contract with the Lincoln Motor Car Works, Chicago, maker of the Lincoln light delivery wagons, for the agency in central Texas.

E. C. Kadow & Co., Chicago, Ill., has been incorporated for $25,000 to manufacture commercial vehicles. The incorporators include Benjamin Gordon, Simon LaGrou and others.

The Rittenhouse-Winterson Auto Company, Baltimore, Md., has taken the agency for the Seitz gearless truck, made by the Seitz Automobile & Transmission Company, Wyandotte, Mich.

Huffer & Band-Haur, Phoenix, Ariz., has taken the state agency for the Moreland distillate truck, made by the Moreland Motor Truck Company, Los Angeles, Cal.

The Reliance Truck & Garage Company, 111-115 East Lynn street, Columbus, O., is building a large addition to its garage to meet the increasing demands for a commercial vehicle service station.

The B. Siegel Company, Detroit, finds that the five Cartercar delivery wagons, made by the Cartercar Company, Pontiac, Mich., and shown in an accompanying illustration, do the work of 15 horse wagons, and that it could not afford to go back to the old system of doing business even if it cost more to operate the trucks, which it does not. Mr. Siegel says he cannot see how any up-to-date firm can continue to use the old horse delivery wagons.

James B. Furber has opened a new office at 260 Halsey street, Newark, N. J., as manager for the Newark agency for I. H. C. wagons, made by the International Harvester Company, Chicago.

The Commercial Auto Company of Lexington, Ky., has taken out articles of incorporation with capital stock of $1500. The following are interested: J. N. Gibbons, W. R. Williams and H. N. Williams.

The Highland Body Company, Cincinnati, O., is issuing an attractive booklet setting forth the merits of the motor truck bodies produced by it. Those interested may secure a copy by addressing the company.

The Newark Auto Truck Manufacturing Company, Newark, N. J., has been incorporated for $500,000 for the manufacture of commercial motor vehicles. The incorporators are O. W. Babbage, H. H. Poole and J. T. Walsh.

G. A. C. Halff, San Antonio, Tex., has organized the Halff Company, with headquarters in Dallas, and will represent the Federal truck, made by the Federal Motor Truck Company, Detroit, Mich., in that territory.

The Nyberg Automobile Works, Anderson, Ind., maker of Nyberg pleasure and commercial cars, announces the appointment of the following agents: Hunter & Co., Steubenville, O.; L. F. Carr, Jacksonville, Fla., and Jack Williams, Buxton, Ia.

The E. A. Hall Motor Truck Company, Boston, Mass., has taken the agency for the Available truck, made by the Available Truck Company, Chicago, and has opened a new service station to take care of its patrons.

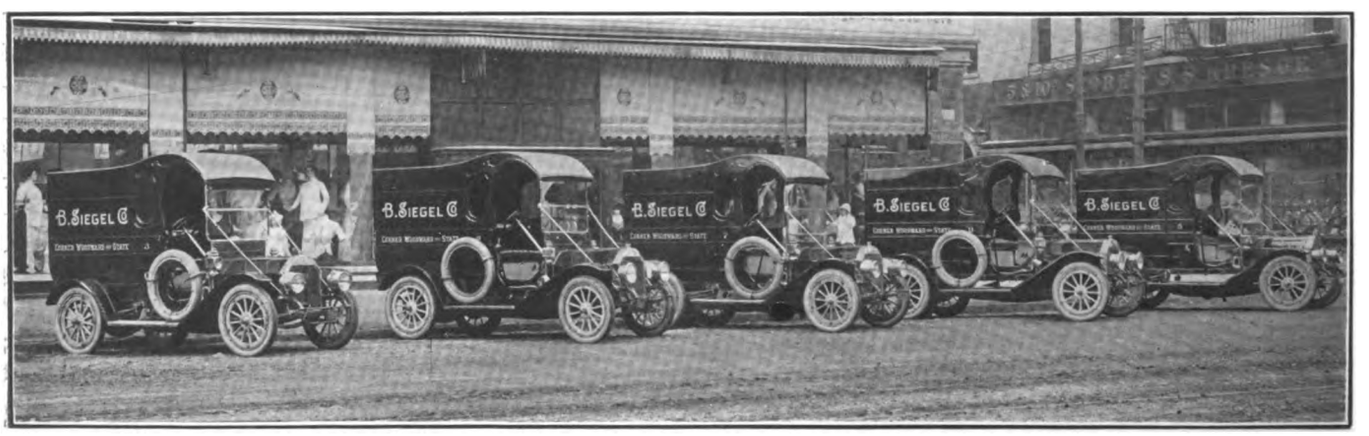
The Lincoln Motor Car Works, Chicago, Ill., maker of Lincoln trucks, has secured the Rockwell Motor Transportation Company, 621 West 42nd street, New York City, as its representative in the metropolitan district.

The Adams Bros. Company, Findlay, O., has appointed the following additional agents for the Adams trucks, made by it: Roscoe Benjamin, Winsted, Conn., and Magna Auto Company, Division and Railroad streets, Holyoke, Mass.

L. W. Williams, for some time connected with the advertising department of the Locomobile Company of America, Bridgeport, Conn., maker of Locomobile trucks and fire apparatus, has entered the truck sales department of that company.

Joseph H. Alfred, chief clerk in the commercial department of the Michigan State Telephone Company, Detroit, has resigned to take a position with the Detroit branch of the Goodyear Tire & Rubber Company, Akron, O., maker of Goodyear tires.

The Suspension Roller Bearing Company, Sandusky, O., is to erect a factory east of the plant of the Sandusky Auto Parts &



Five Cartercar Delivery Wagons in Service with the B. Siegel Company, a Well Known Detroit Department Store.

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Motor Truck Company on First street, to cost approximately $30,000.

The Hatfield Auto Truck Company was recently incorporated in Elmira, N. Y., with a capital stock of $1,500,000 to manufacture motor trucks. The incorporators are David H. McConnell, A. D. Henderson, A. S. Hoyt, all of New York City, and others.

The Taxi Service & Baggage Corporation of Wilmington, Del., has been incorporated under the laws of Delaware with a capital stock of $150,000. The incorporators are W. J. C. Dulany, Baltimore, Md.; W. L. Lamberdin and A. P. Thom, Jr., of Norfolk, Va.

The Shaffer Auto Supply Company, 1240 Broadway, Denver, Col., is the name of a new concern which will handle standard accessories and supplies for pleasure and commercial motor vehicles. The agency for the Blair truck has been taken for Colorado.

The Genge Power Vehicle Company, St. Paul, Minn., has been succeeded as agent for the Grabowsky truck, made by the Grabowsky Power Wagon Company, Detroit, by the Motor Truck Company of that city. S. L. Buchanan and T. D. Lovering are the proprietors.

Bush & Holland recently took over the business of E. H. Bush, Springfield, O. The new concern will continue to carry on the wagon and carriage repair business located on South Fountain avenue, and will also conduct an agency for the Detroit motor wagon.

E. Q. Cordner, who has been sales manager of the American-Marion Sales Company in New York City, has resigned to become manager of agencies for the R. & L. Company of that city, general eastern representative of Garford trucks, made by the Garford Company, Elyria, O.

The R. & L. Company, Brooklyn, N. Y., eastern agent for the Garford line of trucks, control of the manufacture of which was recently secured by President John N. Willys of the Willys-Overland Company, has decided to open a new branch at Bedford avenue and Fulton street.

The Service Recorder Company, 2344 East 105th street, Cleveland, O., announces that the Alco truck which is engaged in hauling a load of merchandise across the continent, is utilizing one of its ServiS recorders, in order to have accurate data concerning the running time en route.

The Todd & Courtney Company has been formed in Barberton, O., with a capital stock of $10,000 to manufacture automobiles, wagons and other vehicles, and accessories. The members of the concern are John H. Todd, Cora A. Todd, I. O. Courtney, Laura E. Courtney and C. C. Courtney.

The Pittsburg Motor Service Corporation, Pittsburg, Penn., has perfected plans for a new fireproof motor truck depot to be erected at First avenue and West street. The building will be five stories in height and contain all modern appliances for the storage and maintenance of commercial vehicles.

The Indiana Garage & Sales Company has become the distributing agent in Kansas City, Mo., and vicinity for the Lincoln light delivery wagon, made by the Lincoln Motor Car Works, Chicago. Headquarters have been opened at 3316 East 15th street, Kansas City. The J-A-R Company, located at 932 Kansas avenue, Topeka, Kan., has closed a contract with the Lincoln company whereby it becomes distributing agent for Topeka and vicinity.

The Chase Motor Sales Company has been organized in Philadelphia to take over the agency for Chase trucks, made by the Chase Motor Truck Company, Syracuse, N. Y., for that city and Montgomery county. A service and maintenance station will be established at 50th and Warrington streets, West Philadelphia.

The Federal Motor Truck Company, Detroit, maker of Federal trucks, announces the appointment of the following additional agencies: Eckenroth Sales Company, Cleveland, O.; Interstate Auto & Supply Company, Sioux City, Ia.; L. C. Hayden, Tecumseh, Mich., and American Truck & Auto Company, Melbourne, Australia.

The Railroal Motor Car Company, Marion, Ind., was recently formed with a capitalization of $200,000. The purpose of the company will be to manufacture and to repair motor vehicles O. and John D. Worth, Hiram Beshore, George R. Stewart and Eben H. Walcott.

Armour & Co.'s three-ton White truck made by the White Company, Cleveland, O., recently took a silver loving cup at the Long Branch Business Men's Association parade in Long Branch, N. J. Fifty other trucks competed in the event. The prize was awarded on the basis of appearance, quietness and low cost of upkeep.

George A. Crane has been secured by the Locomobile Company of America of Bridgeport, Conn., to take charge of its truck business in the territory controlled by the Chicago branch. Before joining the Locomobile forces, Mr. Crane was connected with the Knox Automobile Company and the United States Motor Company.

The Otis Motor Car Company has been incorporated in South Bend, Ind., with a capital stock of $10,000. The members of the firm are N. L. Otis, Gilbert Squires and J. B. Beattie. The company has a location at Main and Division streets, and has the agency for the Kelly, Franklin and Chase trucks, and the Cadillac and Franklin pleasure cars.



Sixty Federal Trucks, Made by the Federal Motor Truck Company, Detroit, Which Took Part in Recent Cadilliqua Parade in That City.

The Westfield Motor Truck Sales Company is a new Boston firm organized to handle the Westfield, manufactured at Westfield, Mass. George L. Cook, identified with the trade for 10 years, is manager and E. A. McGrath is in charge of the well equipped service station, which contains apparatus for all sorts of car repairing.

The Auveco Company was formed recently in Buffalo, N. Y., for the purpose of conducting a commercial vehicle salesroom and garage. The directors include Otto A. Magelin, Thomas LaVere, Walter W. Miller, W. H. Rodenhouse, James Fox, Forbes Foster, Fred Baker, Frank H. O'Neill, James Moran, W. H. Gentz and Henry G. Walters.

Fred A. Crooks was recently appointed sales manager for the American Locomotive Company, New York City and Providence, R. I., in the New York branch. Mr. Crooks has been identified with the automobile industry for five years, being formerly associated with the Darracq Motor Company and the Palmer & Singer Manufacturing Company.

William E. Norris, Bridgeport, Conn., proprietor of the General Motors Service & Truck Company, has leased the garage formerly occupied by the Miller Motor Car Company. While the business of the General Motors Service & Truck Company has been confined heretofore to the sale of trucks, it will now maintain a thoroughly up-to-date garage with first class equipment for the care and repair of pleasure and commercial cars.

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The Westcott Motor Truck Company, Little Rock, Ark., has been organized by I. Kempner, Irving S. Hirsch, Harry M. Westcott and Asa Gracie to engage in the transferring business.

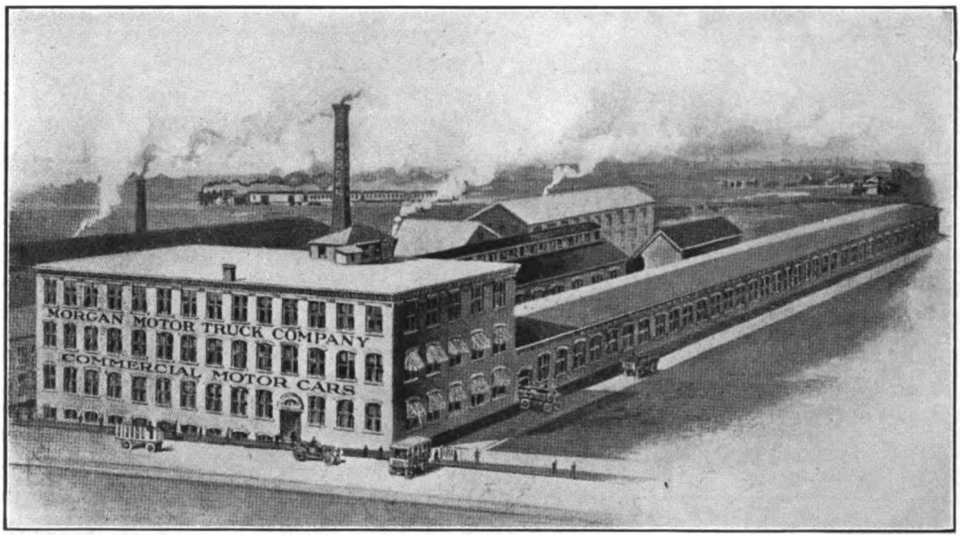
The Federal Motor Truck Company, Detroit, maker of the Federal trucks, has placed the following agencies: Vancouver Isle Motor Company, Vancouver Isle, B. C.; David Stahler, Portsmouth, O.; Allen Baker, St. Louis, Mo.; American Motor Truck Company, Melbourne, Australia.

A. W. Salyers, former manager of the Buick Motor Company's Indianapolis truck branch, has been elected treasurer of the reorganized Showalter Manufacturing Company, Indianapolis, maker of automobile bodies. New offices have been secured at 316 Hanson avenue, Indianapolis.

Norwood Bros., Inc., Baltimore, Md., has taken on the valveless Veerac light delivery wagon. The motor has five moving parts, no radiator, no water or oil pumps, no valves, or no complication of parts. Models of this wagon are in use by John Wanamaker & Company, Singer Sewing Machine Company and others.

The Packard Motor Car Company, Detroit, has received the resignation of A. S. Holly, Boston, as manager of the truck department of the firm. He has taken the position of manager of the factory branch of the Kelly Motor Car Company at New York and will have as his territory a good portion of New York state, New Jersey and Connecticut.

The Morgan Motor Truck Company, Worcester, Mass., is meeting with deserved success in the manufacture of the Morgan truck. An accompanying illustration shows the new factory buildings, and a reorganization of the official force, which has just been completed, places the company in an enviable position for the coming season.



Factory of the Morgan Motor Truck Company, Worcester, Mass., Where Morgan Trucks Are Made.

The J. W. Leavitt Company, San Francisco, expects a prosperous year as the result of a trip through the Northwest just completed by Capt. Andrews of the concern, who has spent a month in that territory in the interest of the Overland and Kissel trucks. Capt. Andrews reports a keen interest in the commercial vehicle line throughout.

The Rainier & Lineberger Company, Boston, general eastern distributor for the Garford Company, Elyria, O., maker of Garford trucks and pleasure vehicles, has taken a lease of the Thomas building on Boylston street. P. C. Chrysler, a motor truck man of wide experience, will be in charge. His son, G. R. Chrysler, will direct the pleasure car end of the business.

The Ideal Auto Company, Fort Wayne, Ind., manufacturer of Ideal motor trucks, has occupied its new factory building, which will facilitate a much larger output than heretofore. G. B. Ball, president of the company, states that with the improvements completed the concern will have capacity for turning out one complete truck a day.

A. B. Cordner, manager of the New York City branch of the General Motors Truck Company, has resigned. It is said that the factory is at present over-burdened with work, necessitating a cessation of orders, which would leave no outlet for several months for Mr. Cordner's selling energy. He is making arrangements to join a new concern to be formed in November.

The Federal Motor Truck Company has added to its staff of executives Garvin Denby, who is prominent in business circles in Detroit and the East. He began his career in 1897 and his success as a superior salesman led to his appointment as secretary and treasurer with general charge over the sales department of the Federal company.

The Garford Company, Elyria, O., maker of Garford trucks, which recently established a new salesroom at Boston, was gratified during the first week of its existence to receive a report from Manager P. H. Chrysler that he had secured an order for three five-ton Garford trucks from the Auto Transportation Company at Lowell, Mass., for use between that city and Boston.

The Todd Manufacturing Company has plans under way to open a factory in Minneapolis, Minn., for the purpose of making radiators, hoods, fenders, drip pans, tanks and other sheet metal specialties for automobiles. The parties representing the firm are Frank Todd, formerly superintendent of the Long Manufacturing Company of Chicago and Detroit; B. A. Wolfe and Morgan C. Wood.

The Kissel Motor Car Company, Hartford, Wis., is erecting a magnificent garage at 237 West Ninth street, St. Paul, Minn., in order to handle the increasing business of the company in that city. The Kissel company intends to guarantee truck service and will always have on hand service trucks to take the place of any that might meet with an accident. Pleasure vehicle owners will also be well cared for.

The General Vehicle Company, maker of gasoline and electric trucks, has filed plans for a six-story factory building to be erected at Long Island City, L. I. The structure will be 75 by 327 feet and eventually two six-story wings are to be added.

The White Company, Cleveland, O., manufacturer of the White pleasure and commercial vehicles, has established a direct factory branch at Baltimore, Md., which has been equipped with a large showroom, in which all the White models are shown, from the small touring car to the "Six-Sixty," and all commercial cars in every size the White company makes. C. E. Trace is manager.

Sauers' Motor Truck Agency, Springfield, Mass., representative of the Adams Bros. Company, Findlay, O., has placed Adams trucks with the following concerns: Wise-Smith Company, Hartford, Conn.; Hemlock Hill Dairy Farm, Norfolk, Conn.; Ferguson Steam Laundry Company, J. P. Flaherty and Casper Ranger, Holyoke, Mass.; E. Y. Curtiss, Lenox, Mass., and Henking Brewing Company, Springfield, Mass.

L. E. Harmon, manager of the truck department of the Myers-Abram Company, Boston, distributor for the Lauth-Juergens truck, made by the Lauth-Juergens Motor Car Company, Fremont, O., has opened a finely equipped service station on Vassart street, Cambridge, Mass., covering a quarter-acre. The plant carries a complete line of parts for the one, two, three, five, seven and 10-ton models placed in the market by the Lauth-Juergens Motor Car Company.

The General Motors Truck Company, Pontiac, Mich., has received another addition to its factory force, E. J. Kilbourn, who resigned as manager of the Kansas City branch of the Mitchell-Lewis Motor Company. By this move he again begins work under his old chief, William L. Day, who in August resigned as sales manager of the Mitchell-Lewis company to become general manager of the General Motors Truck Company.

The Ohio Motor Company, Toledo, O., has been incorporated by E. J. Ansted, W. M. Shields and others to have the distributing agency for the Randolph trucks and Commerce delivery cars. A station has been opened.

The Indiana Garage & Sales Company has become the distributing agent in Kansas City, Mo., and vicinity for the Lincoln light delivery wagon, made by the Lincoln Motor Car Works, Chicago. Headquarters have been opened at 3316 East 15th street, Kansas City. The J-A-R Company, located at 932 Kansas avenue, Topeka, Kan., has closed a contract with the Lincoln company whereby it becomes distributing agent for Topeka and vicinity.

The Kissel Motor Car Company, Hartford, Wis., maker of the KisselKar trucks, has announced the following new agency appointments: Charles F. Hamilton, Carbondale, Ill.; L. M. Dunn, Mineral Wells, Tex.; W. A. Bell, San Angelo, Tex.; Wesley A. Hill, Phoenix, Ariz.; Myron R. Churchill, Marinette, Wis.; L. D. Collier, Salisbury, Md.; B. & H. Garage, Jersey City, N. J.; George Finck, Syracuse, N. Y.; H. A. Fuller & Co., New Rochelle, N. Y.; Percival & Silsby, St. Johnsbury, Vt.; D. L. Boureau, Regina, Saskatchewan; H. H. Kerr, Calgary, Alberta; J. D. Lapointe, Montreal, Can.

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The Motor Truck
Devoted to Motor Driven Business Vehicles of All Classes.

VOL. III. PAWTUCKET, R. I., NOVEMBER, 1912 No. 11

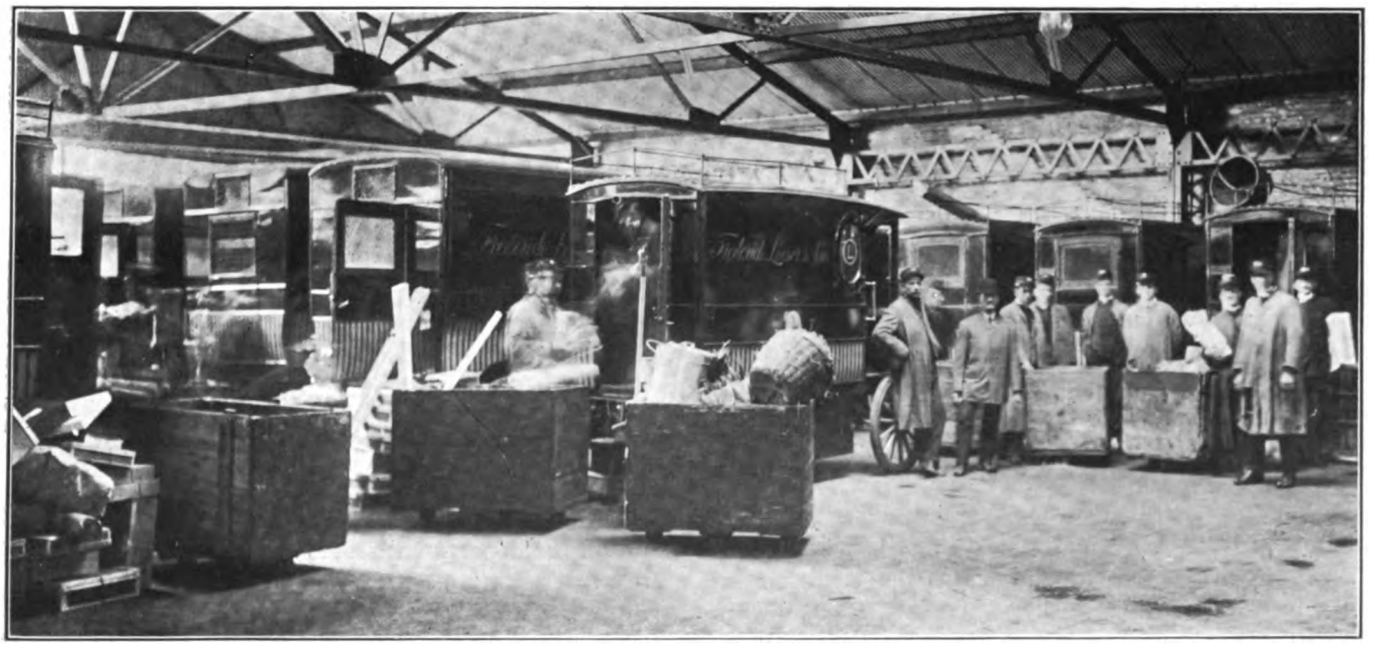
NEW YORK DEPARTMENT STORE DELIVERY.

Motor Vehicle Equipment of Frederick Loeser & Co., Maintained to High Efficiency Standard, Affords Ideal Service and Displaces Animals After Comparative Work That Permits Absolutely Accurate Determination.

By William W. Scott.

THE business man whose sales must be delivered to his customers realizes to a greater or less extent the need of economy in labor and time, and seeks to minimize so far as this may be practical with his facilities and resources. It is natural enough for him to stimulate custom by expeditious delivery, and yet competition makes imperative a service that may be regarded as costly. This same competition limits prices and minimizes profits, and with a comparatively small variance in the cost of goods it is essential that expense of every character be kept at the lowest possible figure. In other words there is a limit to profit and expense must be minimized.

With the large business enterprises of today haulage and delivery is not incidental. Upon delivery, quite as much as upon quality and price, depends patronage. Not only must accommodation or conveniencing customers be considered, but expedition is a potent factor. While it may be said that this principle will apply with reference to all localities, the delivery of merchandise sold in a present-day department store in New York City becomes a problem of first magnitude. The city is the largest in America. The distances within the municipality itself are great. The volume of transactions is extremely large, the location of the city is such as to congest population, business and highway traffic, and the overflow from the island of Manhattan has been in every direction, following the line of least resistance.



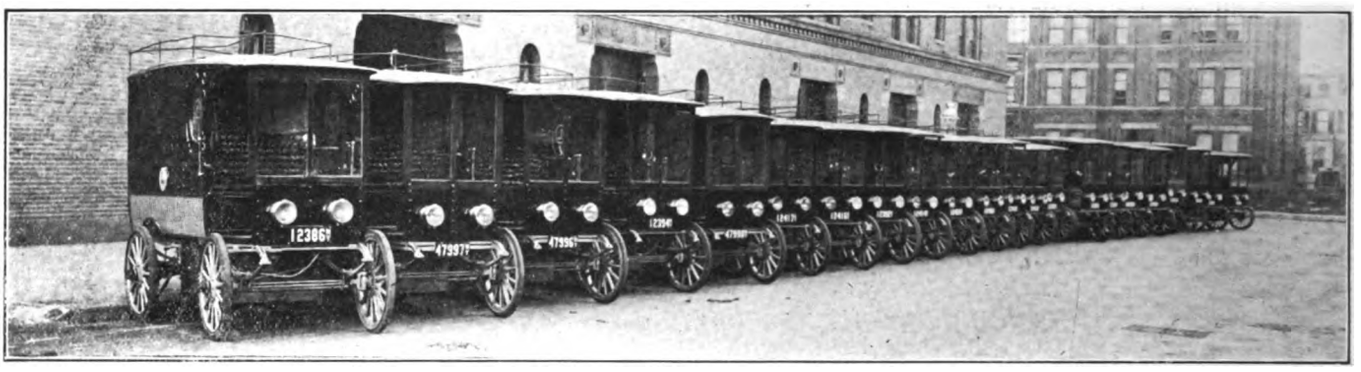
Section of the Loading Shed of Frederick Loeser & Co., in Schemerhorn Street, Where the Wagons Are Made Ready for the Routes.

The greater part of the business traffic is by daylight. There is a proportion of haulage during the hours of darkness, but this is comparatively small. The

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department store is a concentration of a number of small enterprises for the convenience of the people and to encourage purchasing. While such a store may be conducted by an individual or firm, it may also be composed of departments leased by and directed by different persons who make their own purchases, but the delivery in such establishments is maintained for the benefit of all by the management. Usually with stores of this character the delivery is provided for in the lease or rental. There are other stores in which the departments are divisions under superintendents and the whole organization directed by an executive or executives.

No matter what the form, however, the business is transacted in a single establishment, and from this delivery is made to any part of the municipality or its suburbs. Competition impels this attention to any customer, no matter what the weight or bulk of the purchase. The department store is an American institution and the development has been to remarkable proportions. In New York such businesses may be said to be developed to the height of merchandizing. They are the greatest achievements of contemporary commercialism. They are the results of serving the people at all times, meeting every demand and stimulating patronage by carefully conceived attention.



Part of the Electric Wagon Equipment of Frederick Loeser & Co., Used for Regular City Delivery.

While it is true that the growth of New York's wholesale section and the expansion of the city has impelled the location of the large emporiums close to the principal transportation terminals, and removal to what may be regarded as the "shopping district," such changes have no influence upon the delivery requirements other than to compel systems that will be in every way efficient over largely increased areas. With the department store of large proportions delivering the purchases has become a science. The customer may buy a pair of gloves or the complete furnishings of a home. The service must be such that it will deliver either purchase without delay, placing the goods in the possession of the purchaser in the same condition sold and at the least cost to the house. The delivery may be 100 yards or 100 miles distant. No matter what the requirement through the sale, the system must be adequate and sufficient.

The department stores usually own delivery equipment sufficient for normal needs, with such reserve as experience dictates is necessary to meet the variable purchasing resultant from special sales, for it is the belief of most of the store managements that notice of inducement of special character is necessary to attract patronage. It is necessary to have facilities that will permit delivering in localities where there is not a sufficient volume of business to justfy the maintenance of the regular service. Besides this there is the haulage of stock from different shipping and railroad terminals to the warehouses and to the stores; part of this work is done by concerns from which purchases are made.

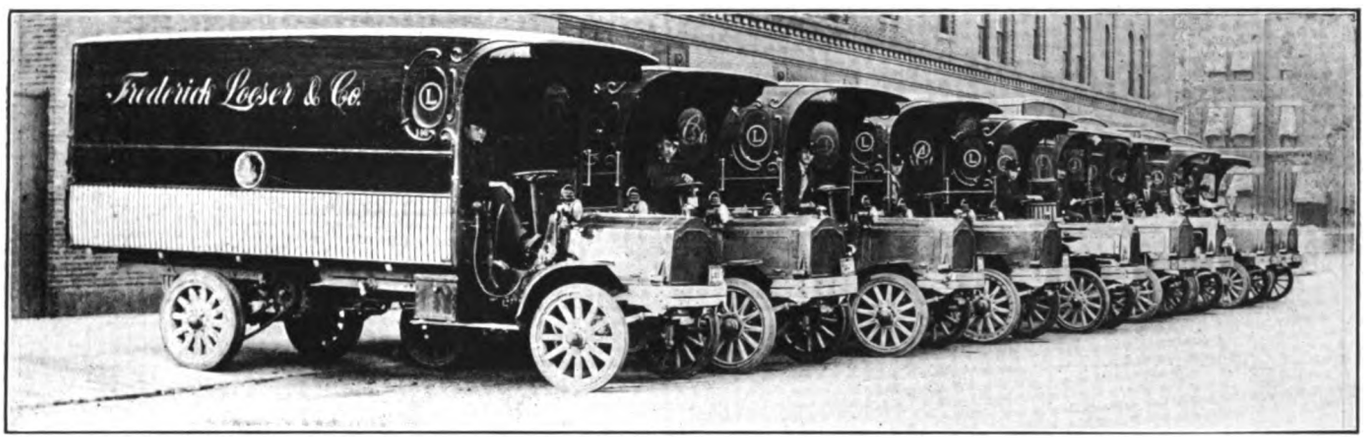
Obviously, the purpose of the store is to maintain what will be the most economical from every point of view. Animal vehicles have been generally accepted as the most practical because they are better known and understood, while mechanical wagons have been regarded as experimental. While it is true that automobile wagons have been used in New York since 1898, having been first utilized by B. Altman & Co., these were for years regarded as being expensive as compared with horse vehicles, and were productive largely from an advertising point of view. The experience of the majority of the department stores of New York that today have motor delivery equipment has been within a period of 10 years, and it may be stated that the larger part of these early installations were electric, as the manufacturers of gasoline vehicles did not until later regard the industrial market of sufficient importance to justify the production of wagons commercially.

Of all the department stores in New York none has more representative delivery equipment than Frederick Loeser & Co., Brooklyn, which is made up of electric and gasoline wagons and trucks, and horse vehicles. Eight years ago the firm used 300 horses, and today it has but 96 in its service, though the business in that period has materially increased. The 204 animals have been replaced by 28 electric and 14 gasoline machines, but considering the development the motor vehicles do much more than the work that could be accomplished by the number of horses stated. The motor wagons have increased from year to year and the horses have lessened. The firm has been long established. Its store is a mammoth five-story structure that covers an entire city block, and the delivery

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department is contained in the sub-basement and basement of a 10-story warehouse reached by a subway beneath a street behind the main building. In the rear of this warehouse is the loading and delivery yard, covered by a roof, where the goods are received or sent out.

It will be understood that this condition is ideal in that the warehouse is practically a part of the main store and may be drawn upon as conveniently as though it were not separate, in that the wagons may be withdrawn from the street during the period of loading and unloading; in that the goods are not exposed to the weather; in that there is no interference from traffic; in that storms do not affect the work; in that there is abundant protection from theft. With the stores that are located in what is known as the "shopping district" of New York the value of real estate is such that the maintenance of a loading shed and a warehouse of such a type and proportions as those used by Frederick Loeser & Co., is absolutely out of the question. For this reason it may be said that this concern has facilities that are extremely favorable.



Some of the Fleet of Packard Wagons of Frederick Loeser & Co, at the Garage in Quincy Street, Brooklyn, N. Y.

Yet it will not be denied that these are economical. Still, these do not materially influence the efficiency of the delivery system.

The loading shed or house is so arranged that it may be entered from either street, though it may be said that its main entrance is in Schemerhorn street, and the drivers may enter or leave from either entrance. It covers a considerable area, and in it the automobile and horse vehicles may be arranged in four lines so that the loading may be done expeditiously. The yard is paved and it is lighted by arc lamps whenever the work requires, for it is necessary for quick handling that the men read the directions on the packages almost at a glance. There are no platforms in the yard, the goods being brought out between the lines of wagons and handled by the two men that constitute the crew of each vehicle.

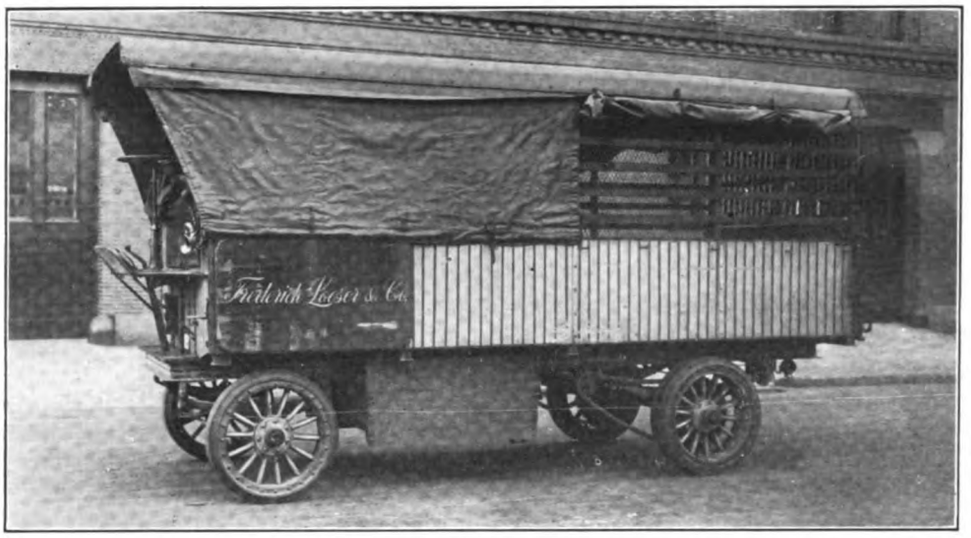
The Loeser store employs roughly something like 3000 persons and there are 66 different departments, each of which is a seperate division. When the purchase is made the goods are passed to an examiner and packer, and after being wrapped or packed are deposited at the examining or packing station. These are later removed in carriers or "wheelers," these being large baskets on rolls, to a central collection point, where they are piled indiscriminately. In the event of individual purchases the packages are indicated by the labels, and where they are purchased by "travellers" books they are designed by special labels.

From the main collection point the goods are sent by a conveyor to the delivery department, where the packages are passed upon by an authorization clerk, whose duty is to establish the correctness and the validity of all charge purchases. Paid and C. O. D. packages are not passed upon by this clerk. The packages then go to route clerks, who mark upon them the numbers of the delivery routes that will carry them out. In the event of "travellers" the packages are collected and wrapped and if there are several packages for one address these are indicated by the labels. The packages are then conveyed to the "post office" where they are sorted by routes and placed in bins in compartments separated by wire grating, and the delivery sheets are made out in triplicate. The sheets account for each package, and one of these is received by the crew of each wagon. This brings the goods up to the point where the actual delivery is begun.

In the delivery of a department store of the proportions of Loeser & Co., the division is under the direction of a superintendent of delivery, who is responsible for the distribution of the goods, and according to the policy of the management, which primarily is with reference to time, as this element enters into competition quite as much as does distance or condition. The superintendent must have intimate knowledge of the streets of the city and the suburbs. He must have a map of each locality constantly before him. He must understand the conditions of the thoroughfares with reference to traffic and paving, and he must know the possibilities of his equipment under normal and unusual demands. He divides his service into two classes —the regular and the special—for the city service, and he must make provision for the transportation and the handling of the goods sent to the suburbs and to the distant destinations.

The city delivery is ordinarily made up of routes on

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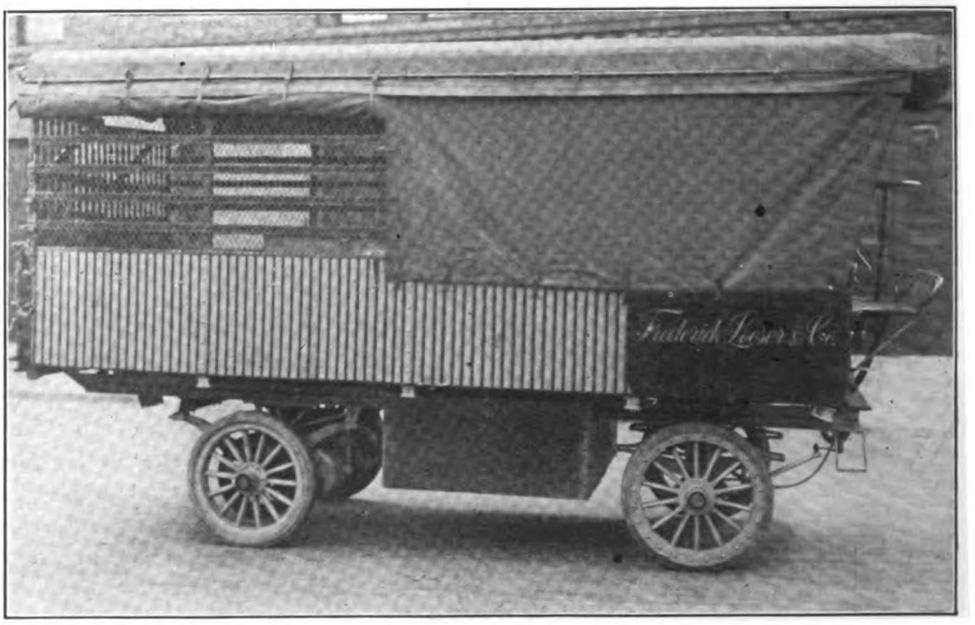
No. 115, an Electric Vehicle Wagon That Has Been in Service for About Eight Years.

the basis of number of packages to be carried and distributed, and the custom with the suburbs is to take large loads to certain points as the patronage justifies, where the packages are sorted and carried out on routes as are those of the city. The haulage between the store and the suburban points of distribution is by what is known as transfer. This service is by vehicles of large capacity that make the hauls rapidly and eliminate the need of each delivery vehicle hauling from the store. In some of the transfer points or stations a number of vehicles are kept and much the same system is maintained as at the store. In others the goods for delivery are sent by express to agents who handle whatever is necessary, possibly doing the work alone.

The city and the suburban delivery is a regular service, but in addition to this may be the special distribution, consisting of furniture, pianos, or goods of similar character. Besides this there is the delivery of orders that may be authorized by the head of the department where the purchase was made, and which is based on a request made by the purchaser. The purchaser may buy conditionally upon the goods being delivered within a specified time, and it is necessary to insure the sale. There is normally variable purchasing and the volume of delivery must correspond to the sales.

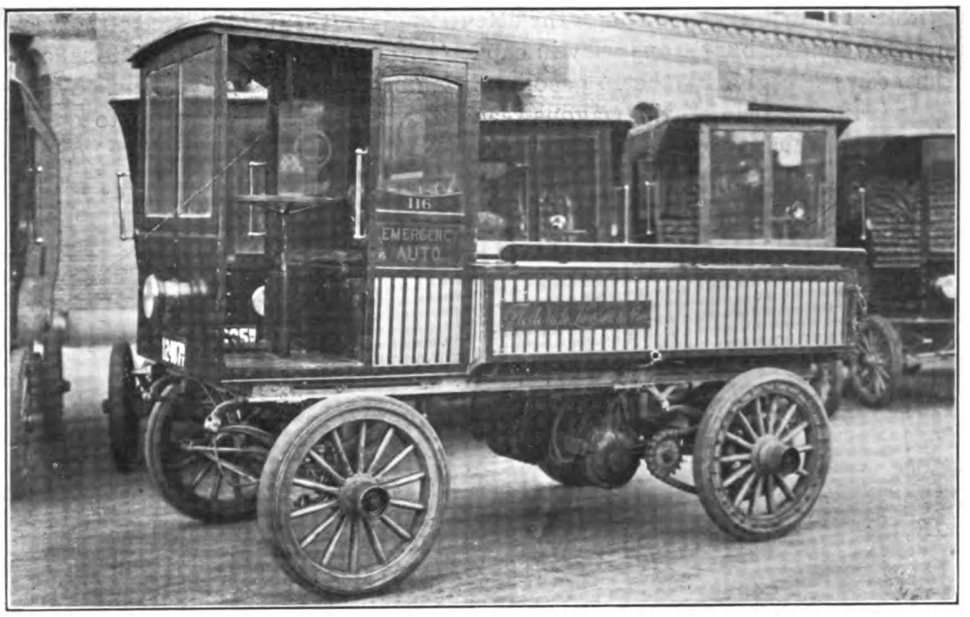
The delivery equipment of the store of Frederick Loeser & Co., is kept in a stable in Quincy street. The brick and stone barn of three stories was built to house more than 300 horses and the wagons sufficient for the animal service. The ground floor of the building is divided equally, a half for each type of vehicle. No. 1 houses the horses and No. 2 the machines. On the upper is located the repair shop for all wagons and automobiles. The crew of each wagon consists of a driver and a conductor, the driver being the older and more experienced and the conductor the younger and probably less versed in the work. The men are given uniforms and caps that they wear while on duty, and those working with the motor wagons wear dusters to protect their clothing. All drivers and conductors report at 7:15 each morning and the stable help has the horses in readiness at 7:30. The electric automobiles are ready for leaving at the same time. The electric and horse wagons are supposed to start at 7:30 and five minutes later all are away, the motor vehicles by one route and the horses another, to avoid confusion and street congestion. Reaching the loading yard at 7:40 to 7:45 the drivers and conductors obtain their delivery sheets and each crew is given a key to a cage or bin, the cage and the route numbers being the same.

The contents of the bins are checked as they are removed and placed in "wheelers" that are covered and locked. The "wheelers" are then taken to the loading shed where the wagons are standing in four lines. The packages are then taken from the "wheelers" and checked as they are "stacked" in the wagons, this process being the packing in the order of delivery. The route may include as few as eight city blocks, and it may cover as many as 40, the number of bundles governing the work to be done. The wagon starts at a given point and traverses the streets in the order speci-



No. 114, a Vehicle Equipment Wagon in Transfer Service—This Machine Has Been in Use for Eleven Years.

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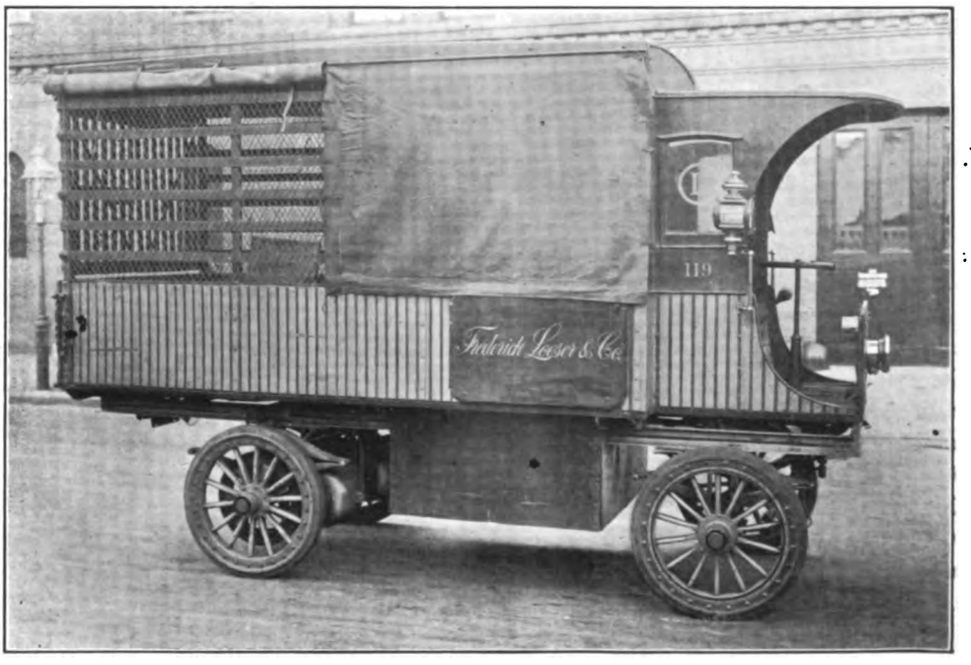
No. 116, a Rebuilt Electric Vehicle Machine Equipped for Emergency Work and Capable of Hauling Five Tons.

fied, the work ending at another point. One route may take in one side of a street and another route the other. After the goods are placed in the wagons and the sheets verified the start is made, those having the longest distance to go starting first, so that as a rule distribution is begun about the same time except in the suburbs.

The system of Frederick Loeser & Co., requires that the three-trip wagons return to the stable and garage after the first trip, and from 11 to 12 the vehicles return. After an hour for lunch the wagons again report at the store and when loaded are again dispatched over the same routes. When this delivery has been completed the wagons report at the store for the third and last loads of the day, leaving about 4:30. When the final delivery has been made the wagons return to the garage and stable, where the drivers and conductors turn in the receipts from collections to the cashiers and the undelivered paid packages to the credit clerks. Then the wagons are searched for bundles that may have been overlooked. The following morning the packages that were not delivered the previous day are turned over to the delivery department and go through the same process as in the original distribution, so there is no uncompleted work to be accounted for. Each day's work is new. Mondays and Saturdays there is some variation from the schedule as stated with reference to the work accomplished, but the system is unchanged. This accounts for the work of the electric and horse wagons, but some may make only two trips when the routes are distant.

With the gasoline machines the distances traversed are longer. They are generally utilized in the transportaton of furniture, pianos and bulky goods, and leave the garage not later than 9 each morning. Of course they do not return unless the work is within a reasonable distance. From the store Brooklyn and Manhattan are covered with regular deliveries. There is one delivery daily in the Bronx, and one delivery is made each day on Long Island nearly to Freeport, in the Rockaways, Flushing, Flatbush, Parkville, Bath Beach and Union Course. Besides these there are the special deliveries. Goods are carried to these points by automobile wagons and distributed by horse wagons. Electric trucks are used generally for transfer service and they leave the garage at 5, reach the store at 5:10, are loaded with locked "wheelers" or crates and are sent away at 6:30. These goods are ready for delivery in the suburbs at the same time as in the city.

The brief outline of the character of the service has been given that there may be understanding of the work performed by the different vehicles. As stated, the route may be very short and the deliveries numerous, while it may be of considerable length and with less frequent stops. When the work of a route so accumulates that the number of packages carried cannot be handled promptly in the time allowed adjustment is



No. 119, One of the Unusual Designs of Body Used with a Vehicle Equipment Chassis.

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made to equalize the loads. As might be assumed, this adjustment is frequent. In the summer, when the business transacted is diminished, the crews are given vacations and the routes increased, advantage being taken of this opportunity to withdraw the vehicles to make them ready for the coming year's service. During the holidays and perhaps other periods when the delivery is very heavy additional vans and wagons are hired and utilized so long as the press is manifested. During such times of unusual service one old man is always placed on each extra vehicle, and as each driver and conductor is expected to know his route thoroughly such changes do not lessen the efficiency of the work.

In the service of Frederick Loeser & Co., the garage and stable is in charge of a superintendent, who is responsible for the equipment until it is placed at the disposal of the superintendent of delivery. The efficiency of the delivery depends upon the vehicles, and these must be maintained with extreme care. The answer to the experience of the concern with motor wagons is the number it has in use and the constantly diminishing horses. Economy and Loeser service are the two essentials. The delivery could be made with two daily trips on the city routes. The third is made for the benefit of the customers. There would probably be some saving were but two deliveries made, but this would not best serve the firm in maintaining its policy. This fact is emphasized to make clear that there are other considerations than mere economy entering into the administration of a large enterprise.

DRIVER'S REPORT.

*Date*_____ 191____

Vehicle *Dept.*

Time Out A.M. P.M. *Conditions*

Odometer Start

Time In A.M. P.M. *Conditions*

Odometer Finish

Total Miles

Remarks:

Signed

_____ *Driver.*

47006

Driver's Report for Electric Wagons, on Card 4.75 Inches Length and Five Inches Width.

Having stated this standard of efficiency it will be interesting to follow the vehicles—the motor wagons—through the attention given them. The 28 electric wagons vary in capacity from 1000 pounds to 3.5 tons, and the 14 gasoline machines from 1.5 to five tons. When the wagons reach the garage at night from 6 to 7 they are driven to a washstand, where two washers go over them thoroughly, and when washed the electrics are placed on charge. Usually charging is begun at 7 in the evening and as there are 27 receptacles this work is done simultaneously. While the charging is progressing the night mechanic goes over the machines. All of the electric wagons are oiled each night and are greased at regular intervals. With the attention indicated as necessary from the reports of the drivers all are in readiness each morning.

When the driver reports at the garage at night he makes out a report on the accompanying blank, this indicating the condition of the machine during the trips of the day. This report may show the need of trifling adjustment or restoration, and this work is taken up according to the demands of the task. If it is found that the work is beyond the capacity of the night force this is held until the following morning for the day mechanic, who is in charge of the repair work. The night mechanic has supplies for ordinary requirements, but withdrawals from the stock room are made only by the day chief.

The daily report card is dropped in a basket in the office. It is taken by the night mechanic, and after he has examined the machine and made such adjustments or restorations as are required to make it serviceable he turns the card over to the man who charges the vehicles. As will be noted from the accompanying form, the charging report is made out to cover each of the 24 receptacles or stations, and under the switch number is given the vehicle number and the open circuit voltage as shown. The voltmeter and ampere meter readings are taken every hour, and a note is made of the ampere-hours for each period in three separate columns under the switch number. Below is a space in which is noted the total ampere-hours of the charge. The name of the man taking the readings is signed to the report. Under this note is placed the number of miles run by the vehicle on charge during the day. From the driver's report and the statement made by the mechanic an entry is made under "Remarks," so that examination of the charging sheet by the superintendent shows him the condition of each vehicle when he reaches the garage in the morning. For further detail he may consult the driver's report. If a breakage has developed that requires more attention than could be given by the night force this is taken charge of by the day mechanic.

It is seldom that a wagon is withdrawn from service. The reports and the examinations while the machines are being oiled and greased are usually sufficient to meet all probable causes for failure, and periodically the wagons are gone over to insure the observation of what might have escaped the usual inspection. The batteries are kept in repair and maintained at a standard efficiency by the battery man, and the

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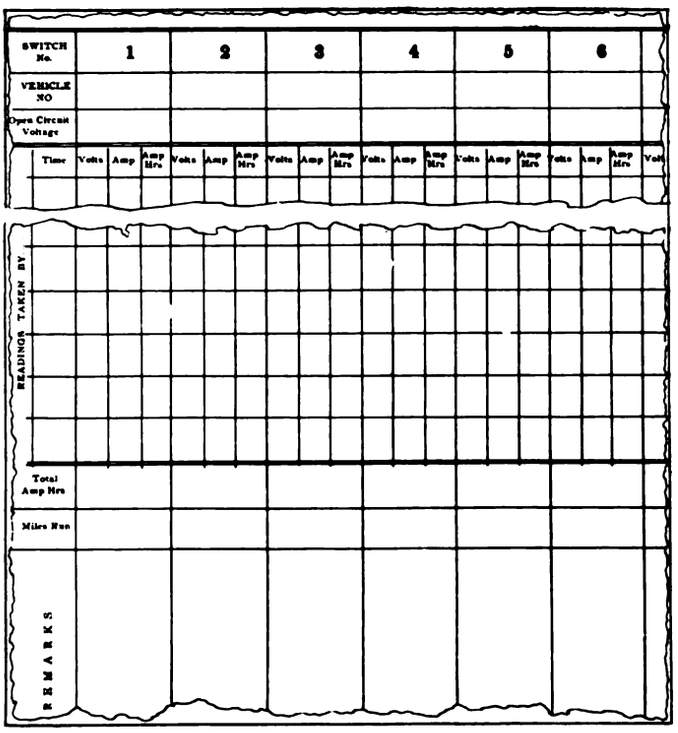
policy is to purchase material and build the lead batteries, this having been found economical. This season, however, a change has been made and all of the wagons have been fitted with Edison batteries, the lead batteries being continued for the trucks. The charging board is located in the centre of the rear wall of the main garage floor, and while this now has equipment for 27 receptacles, it is to be increased to 35, which will considerably exceed the present needs. The company for a considerable length of time produced its own current, but when the gasoline engine generating plant was outgrown it was believed best to purchase current from the commercial lines of the Brooklyn Edison Company.

In the repair department of the electric wagon garage is kept a small supply of such parts as might be needed from time to time. As the machines are General Vehicle, Vehicle Equipment and Electric Vehicle wagons, it will be understood that it is possible to obtain spares of the first two makes with great ease, and provision has been made for any exigency that might arise with the last make named.

The gasoline wagon department has been conducted three years with entire success by a system that has minimized cost to a surprising degree. All of the drivers of these machines are hired with the understanding that they are to care for and keep their machines operative. The wagons are driven into the garage at night and are washed. They are not given attention until the next morning, unless the drivers want to do work on them. The drivers report at the same time in the morning as do the drivers of the electric wagons, but they have an hour and a half before starting to work on their machines. In exceptional cases two hours might be allowed, but the men are expected to leave by 9 unless there is sufficient reason for working another half hour.

With this time permitted before starting the machines are always in use, unless in the case of breakage, but it is rare that anything serious is developed, for the constant and systematic care each day is an admirable insurance. As an illustration of the possibilities it may be stated that one machine was driven for 22 months before it was overhauled, and in that time never missed a day. The mileage for the gasoline wagons will average 45 except in the spring months, when it will range from 60 to perhaps 70, for there are numerous deliveries made in the country and at the shore. It will be seen that with an average of approximately 50 miles daily for about 50 weeks the total is not far from 15,000 miles a year.

The electric wagons are used on the city routes and the transfer service and the mileage will vary materially, because nine of the routes are comparatively short, yet the customers are close together and in numerous instances deliveries are made at a number of houses side by side. These are known as "peddling" routes and the men are kept very busy, though driving short distances. When the loads are "stacked" the conductor rides at the rear on a seat and he calls the number of the street, to which the machine is driven. In the city delivery the loads are placed in and taken from the wagons at the rear. The experience has been that in the practical use of the electric wagons faster and better work can be done than with horses from the fact that the driver and conductor can distribute the load, both visiting customers. As it is necessary for a customer to sign a receipt for a package if a charge or paid account, or pay if it is a C. O. D. purchase, it will be seen that time is required. In the event of goods sent on approval there is a receipt to be signed. When a horse is used the orders are for the driver never to go out of sight of the animal, which precludes more than one man working in actual delivery, and more time is necessary in covering a given route. Not only this, the speed limit is nine miles an hour for a horse against 15 miles for the electric, so on



Charging Record for Electric Wagons with Provision for 24 Entries, on Sheet 11.5 Inches Length and 27.5 Inches Width.

the routes where the deliveries are more scattered the latter has a decided advantage.

In the periods of heat or where the streets are obstructed by snow or traffic, the motor wagons have been found to give admirable satisfaction, being tireless and always sufficient in capacity to meet any requirements. Some of the electrics have been used for years. Eight years ago there were three in service, one being a Vehicle Equipment machine and the other two Electric Vehicle wagons. One Electric Vehicle wagon of 4000 pounds capacity is used as a transfer between the store and the distribution station at Parkville, a distance of eight miles, and while it has been in service 11 years it is regarded as doing work that is quite as important as any machine operated. It is driven more than 30 miles each day and has been driven frequently from 35 to 40, while it has carried a full load 32 miles. This work is the more creditable

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when it is understood that it has to climb a hill of considerable length on a 10 per cent. grade.

The electric wagons have been found to endure remarkably under the conditions of usage and they have been maintained at a very satisfactory cost. One of the reasons for the machines enduring consistently is that annually, between July 4 and Labor Day, each wagon is taken down and thoroughly overhauled. It is made ready for a year's service, and after it has been placed in fine condition and the body painted it is ready for use for many months. During the same period the gasoline machines are given similar attention and if the driver wants to do this work during his vacation he is paid for this in addition to receiving his regular vacation pay.

The instruction is that when the vacation season has ended every vehicle must be in the best condition possible. Nothing is neglected to insure the wagons being in readiness for a year's work. That is a part of the firm's policy. Constant maintenance is the price of efficiency, but it is profitable.

Were one to inspect the machines of the older type in use there would be surprise at the conditions found. There are little evidences of wear, and the designs would be the only reason for attention being directed toward them. Several of them are old, in fact veterans of motor vehicles, but they are always serviceable. One of the wagons that is always regarded with interest is the emergency machine, which has the batteries arranged along the sides of the body, and this is an Electric Vehicle wagon that has the power to haul five tons. Another vehicular curiosity is the Vehicle Equipment wagon that has a peculiar cab design.

The experience of Frederick Loeser & Co., is that in department store delivery, in the routes where it would be maintained by many users of motor wagons horses could be more economical, that the electric is ideal for the service. The electric has given equal satisfaction for transfer service. When the runs have been for comparatively long distances the gasoline machines have been found extremely practical. Both have been proven in the work for which they are adapted to be decidedly superior to horse haulage. There is a large measure of economy in careful upkeep and maintenance. The reason for the success of the motor delivery of Loeser & Co., is the care given the equipment and the commonsense method of its utilization.

NEWS OF THE COMMERCIAL VEHICLE INDUSTRY.

Maker of Kelly Truck Changes Name to Kelly-Springfield and Increases Capital Stock—Future Plans of United States Motor Company—Chicago Show Exhibitors.

The Kelly Motor Truck Company, Springfield, O., maker of Kelly trucks, has been completely reorganized and refinanced, according to the plans recently announced by President E. S. Kelly. Papers have been filed with the secretary of state incorporating the Kelly-Springfield Motor Truck Company, as the concern will be known in future. The authorized capital is $2,500,000, while that of the old corporation was $450,000.

The new company has taken over the plant and assets of the Kelly Motor Truck Company, which formerly was the Oscar Lear Motor Car Company, and the principal stockholders are E. S. Kelly and J. S. Crowell, both of Springfield. The object of the concern, which is being financed by Emerson McMillan & Co., a New York City banking house, is to increase the facilities of the plant, which had an output of 1200 trucks during the present year.

SATISFACTORY REORGANIZATION PLAN.

Stockholders of United States Motor Company Will Be Assessed $24 a Share.

It is stated that all interests affected by the reorganization of the United States Motor Company, New York City, which went into the hands of receivers Sept. 11, have agreed upon a reorganization plan under which the stockholders will be assessed $24 a share on the preferred and common stock of the parent organization and on the preferred and common stock of the Columbia Motor Car Company, Hartford, Conn., one of its subsidiaries. It is understood that the total capitalization will be scaled down as follows:

For and in consideration of the $24 assessment, the new company will issue in exchange for the preferred certificates 24 per cent. of new first preferred, 25 per cent. of the second preferred and 30 per cent. of common. This assessment means that the new company will start out with a clear capital for working operations of about $3,000,000. It is proposed to raise by this method the sum of $5,720,000. The remainder will be used for funding the matured obligations.

At this time there is still remaining in the treasury of the company the sum of $1,000,000. The distribution of this fund was one of the chief matters of contention in the deliberations of the merchandise creditors. It is understood that a compromise has been reached, whereby these creditors will receive 25 per cent. of their claims in cash, 25 per cent. in first preferred, 25 per cent. in second preferred and 15 per cent. in common, thus making a settlement of approximately 90 cents on a dollar.

All first and second preferred stock of the new company and all common stock other than shares reserved to qualify directors is to be vested for a term of not exceeding five years in Charles H. Sabin, Harry Bronner and James C. Brady, and their successors as vot-

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ing trustees, and voting trust certificates in such form as may be determined by the committee will be distributed in lieu of stock. Voting trust certificates are intended to be distributed to creditors and stockholders participating in this plan substantially as follows:

First Preferred Stock.

To depositing holders of debenture bonds and bond scrip (50%)	$3,080,755
To depositing holders of claims against the Motor company only (25%)	475,906
To depositing stockholders of the Motor company and of the Columbia company duly paying the assessments hereinafter provided for:	
Preferred stockholders (24%)	2,763,152
Common stockholders (24%)	2,957,844
Total	$9,277,657

Second Preferred Stock.

To depositing holders of debenture bonds and bond scrip (50%)	$3,080,755
To depositing holders of claims against Motor company only (25%)	475,906
To depositing stockholders of the Motor company and of the Columbia company duly paying the assessments hereinafter provided for:	
Preferred stockholders (25%)	2,878,283
Common stockholders (17½%)	2,156,761
Total	$8,591,705

Common Stock.

To depositing holders of debenture bonds and bond scrip (40%)	$2,464,604
To depositing holders of claims against Motor company only (15%)	285,543
To depositing stockholders of the Motor company and of the Columbia company duly paying the assessments hereinafter provided for:	
Preferred stockholders (30%)	3,453,940
Common stockholders (30%)	3,697,305
Total	$9,901,392

WILLYS WITHDRAWS SUIT.

Trouble with Former Officials of Gramm Motor Truck Company Is Amicably Settled.

The action instituted last August by John N. Willys, president of the Willys-Overland Company, maker of Overland cars, against A. K. White and W. T. Agerter, formerly president and treasurer, respectively, of the Gramm Motor Truck Company, Lima, O., maker of Gramm trucks, has been settled amicably, according to an announcement from Toledo, O.

Mr. Willys alleged in his complaint that the values shown in the statements under which he purchased the stock of the Gramm company from White and Agerter, were not correctly represented and sued for a rescindment of the purchase contract. The matter has been settled by a readjustment of values, which, by his consent to a withdrawal of the suit, is apparently satisfactory to Mr. Willys.

BUY PEERLESS STOCK.

Five Men Prominent in National Electric Lamp Company Powerful Factors in Automobile Firm.

Substantial blocks of stock have been purchased in the Peerless Motor Car Company, Cleveland, O., maker of Peerless pleasure and commercial cars, by five of the men most prominent in the National Electric Lamp Company, Cleveland, O., a branch of the General Electric Company. They are H. A. Tremaine, B. G. Tremaine, J. B. Crouse, J. R. Crouse and F. S. Terry, and they now form a powerful factor in the affairs of the automobile manufacturing concern.

There will be no alliance between the corporations, as such, but the experience and connections of the lamp men will furnish important impetus to the development of the Peerless company's business. Besides 20 acres of property in Cleveland, the Peerless company owns the ground and nine-story building on Broadway, New York City.

BECOMES FEDERAL EXECUTIVE.

Garvin Denby Is New Secretary and Treasurer in Charge of Sales Department.

Garvin Denby, prominent in business circles in Detroit and the East, has been added to the executive staff of the Federal Motor Truck Company, Detroit, maker of Federal trucks, his position being secretary and treasurer with general charge over the sales department. Mr. Denby has achieved much success in his previous business connections. He began his career in 1897 when he started with the Gilbert Wilkes Company of Detroit, in the electrical and engineering department. He passed two very successful years with this concern until the spring of 1899, when he was appointed attache of the first Philippine commission under Chairman Schurman, spending a year in the Insular possessions.



Garvin Denby, Secretary Federal Motor Truck Company.

He left the government service in 1900, joining the forces of the Solvay Process Company of Detroit. He was appointed assistant in the soda ash department, where he was successful, being transferred in 1907 to the head offices at Syracuse, N. Y. His past excellent record resulted in his choice for assistant to the president, which position he occupied until joining the Federal Motor Truck Company.

NEW RUBBER CONCERN.

Well Known German Firm of Polack Tire & Rubber Company Will Establish Factory at Bridgeport.

The Polack Tire & Rubber Company, Waterhausen, Germany, with branches at Sydney, Australia;

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London and Paris, is expected to locate a factory at Bridgeport, Conn., for the manufacture of its product, the Polack solid rubber tire for motor vehicles. The concern has secured a building owned by the Bridgeport Copper Company, which is being remodelled to receive the heavy machinery necessary for the work. This will be installed immediately after its shipment from Trenton, N. J., where such machinery is made.

Herman W. Polack, grandson of the founder of the German company, B. Polack, will be vice president of the American concern and is said to anticipate having the factory in operation in the near future. The German company was organized in 1863 and grew gradually until the advent of the motor car industry, since which time it has found a market all over the world for its rubber tires.

CHICAGO TRUCK SHOW.

Exhibition Space Taxed to Utmost and Display Will Be More Comprehensive Than Ever.

Exhibition space at the Chicago show, to be held Feb. 10-15, has been allotted to 65 commercial vehicle manufacturing companies. These drawings took all of the ground floor space of the Coliseum, Coliseum Annex and First Regiment Armory, with the exception of five of the least desirable spaces comprising about 2500 square feet. Three of these spaces have since been taken and there are still six applicants on the waiting list, as follows: Mogul Motor Truck Company, Chicago; Mercury Manufacturing Company, Chicago; H. J. Koehler S. G. Company, New York City; Ideal Auto Company, Fort Wayne, Ind.; Kentucky Wagon Manufacturing Company, Louisville, Ky.; Ware Motor Vehicle Company, St. Paul, Minn. Of these, the Mogul Motor Truck Company and the Mercury Manufacturing Company have exhibited before at Chicago and the Koehler company exhibited at the Grand Central Palace show in New York last winter.

The situation indicates that the exhibitions this season will be considerably larger than those a year ago and in all probability it will be necessary to utilize the basement under the Annex for the first time at the truck show. There will doubtless be numerous belated applications between now and the opening of the display, which can be taken care of in no other way. There will be no motorcycle section this winter and the centre of the second floor of the Annex occupied by it will be filled with motor car parts and accessories, so that this part of the show will be more comprehensive than heretofore. Most of the members of the Motor & Accessories Manufacturers will continue their displays from the first to the second week and there will be many sundries displayed by unaffiliated concerns.

In the accompanying list of complete vehicle makers already allotted space are 10 that are new exhibitors at Chicago. These are: Brown Commercial Car Company, Buffalo Electric Vehicle Company, Four-Wheel Drive Auto Company, Gramm-Bernstein Company, Krebs Commercial Car Company, Lippard-Stewart Motor Car Company, D. F. Poyer & Co., Standard Motor Truck Company, Transit Motor Truck Company and Universal Motor Truck Company. It will be noticeable, therefore that the large companies have extended their lines and are offering a wider range of capacities than formerly. In some cases they have added electric vehicles to the gasoline truck lines or gasoline trucks to their electric lines. The complete list of exhibitors follows:

Coliseum.

Adams Bros. Company, Findlay, O., Adams.
American Locomotive Company, Providence, R. I., Alco.
Autocar Company, Ardmore, Penn., Autocar.
Buffalo Electric Vehicle Company, Buffalo, N. Y., Buffalo electric.
Buick Motor Company, Flint, Mich., Buick.
Clark Delivery Car Company, Grand Crossing, Ill., Clark.
Dayton Auto Truck Company, Dayton, O., Dayton.
Federal Motor Truck Company, Detroit, Mich., Federal.
Flint Motor Wagon Department, Durant Dort Carriage Company, Flint, Mich., Best.
Garford Company, Elyria, O., Garford.
General Motors Truck Company, Pontiac, Mich., G-M-C.
Gramm Motor Truck Company, Lima, O., Gramm.
Hupp Motor Car Company, Detroit, Mich., Hupmobile.
International Motor Company, New York City, Mack, Hewitt, Saurer.
Thomas B. Jeffery Company, Kenosha, Wis., Jeffery.
Kelly-Springfield Motor Truck Company, Springfield, O., Kelly.
Kissel Motor Car Company, Hartford, Wis., KisselKar.
Krebs Commercial Car Company, Clyde, O., Krebs.
Locomobile Company of America, Bridgeport, Conn., Locomobile.
W. H. McIntyre Company, Auburn, Ind., McIntyre.
Old Reliable Motor Truck Company (formerly Henry Lee Power Company), Chicago, Old Reliable.
Peerless Motor Car Company, Cleveland, O., Peerless.
Pierce-Arrow Motor Car Company, Buffalo, N. Y., Pierce-Arrow.
Pope Manufacturing Company, Hartford, Conn., Pope-Hartford.
Reo Motor Car Company, Lansing, Mich., Reo.
Selden Motor Vehicle Company, Rochester, N. Y., Selden.
Sternberg Manufacturing Company, Milwaukee, Wis., Sternberg.
Speedwell Motor Car Company, Dayton, O., Speedwell.
Studebaker Corporation, Detroit, Mich., Studebaker.
United States Motor Truck Company, United States.
Velie Motor Vehicle Company, Moline, Ill., Velie.
Walker Vehicle Company, Chicago, Ill., Walker electric.
Waverley Company, Indianapolis, Waverley electric.

Coliseum Annex.

Bowling Green Motor Car Company, Bowling Green, O., Modern.
Chase Motor Truck Company, Syracuse, N. Y., Chase.
Dart Manufacturing Company, Waterloo, Ia., Dart.
Lippard-Stewart Motor Car Company, Buffalo, N. Y., Lippard-Stewart.
M & P Electric Vehicle Company, Detroit, Mich., M & P electric.
Service Motor Car Company, Wabash, Ind., Service.
Standard Motor Truck Company, Detroit, Mich., Standard.
Transit Motor Truck Company, Inc., Louisville, Ky., Transit.
Universal Motor Truck Company, Detroit, Mich., Universal.

First Regiment Armory.

Avery Company, Peoria, Ill., Avery.
Baker Motor Vehicle Company, Cleveland, O., Baker electric.
Bessemer Motor Truck Company, Grove City, Penn., Bessemer.
Brown Commercial Car Company, Peru, Ind., Brown.
Chicago Pneumatic Tool Company, Chicago, Little Giant.
Commerce Motor Car Company, Detroit, Mich., Commerce.
Four-Wheel Drive Auto Company, Clintonville, Wis., Four-Wheel Drive.
General Vehicle Company, Long Island City, N. Y., G. V.
Gramm-Bernstein Company, Lima, O., Gramm-Bernstein.
Harwood-Barley Manufacturing Company, Marion, Ind., Indiana.
International Harvester Company, Chicago, International.
Lauth-Juergens Motor Truck Company, Fremont, O., Lauth-Juergens.
National Motor Truck Company, Bay City, Mich., Natco.
Packard Motor Car Company, Detroit, Mich., Packard.
D. F. Poyer & Co., Menominee, Mich., Menominee.
Alden Sampson Manufacturing Company, Detroit, Mich., Sampson.
Sanford Motor Truck Company, Syracuse, N. Y., Sanford.
A. O. Smith Company, Milwaukee, Wis., Smith.
White Company, Cleveland, O., White.

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TESTING EFFICIENCY OF WORM GEARING.

OWING to the fact that a number of American manufacturers have produced worm driven trucks during the past two years, and that such construction is to be found quite generally on commercial cars of foreign makes, it must be assumed that the industry in this country is considering the subject with more or less interest. Herewith is presented the report of William H. Kenerson, Providence, R. I., a member of the American Society of Mechanical Engineers, respecting a series of trials conducted at the plant of the Brown & Sharpe Manufacturing Company, Providence, with a view to determining the efficiency of worm gearing for automobile transmission systems. While there does not appear to have been any attempt to limit the investigation to the commercial type of automobile, the results obtained cannot help but be of interest to all makers and users of mechanical transports.

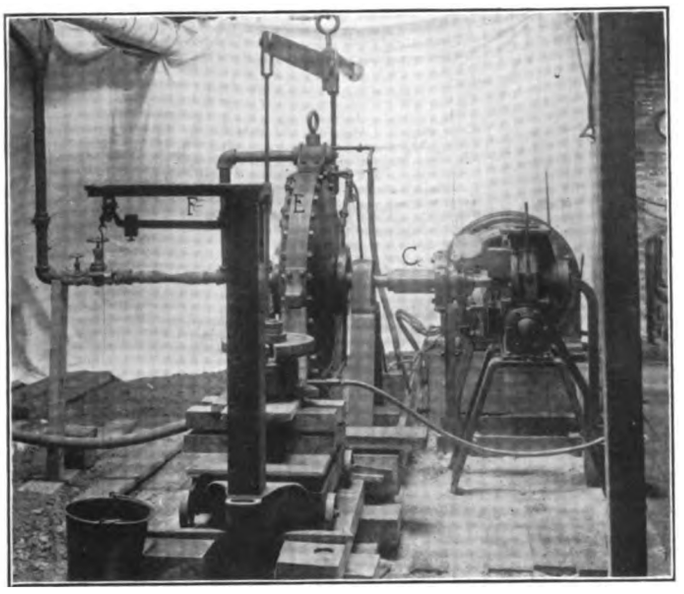


Fig. 1—Arrangement of Testing Apparatus, Showing Transmission Dynamometer Set Up for Comparison with Alden Brake.

By William H. Kenerson.

This investigation was made at the plant of the Brown & Sharpe Manufacturing Company for the purpose of determining the efficiency of three types of worm gearing for use in an automobile transmission system, and the heating effect due to continuous running. The power for these tests was obtained from a 50 horsepower induction motor, running approximately 870 revolutions a minute at full load.

Between the motor and the worm gearcase was placed an automobile transmission gearcase to enable tests to be made at two lower speeds. Between this and the worm gearcase was placed a transmission dynamometer designed by the author. An Alden brake was used to absorb and measure the power transmitted by the gears under test.

The arrangement of the apparatus is shown in Fig. 1, which shows the transmission dynamometer set up for comparison with the Alden brake, and in Fig. 2, which shows the whole apparatus mounted ready for testing the worm gear efficiency. Referring especially to Fig. 2, A is the motor, B the automobile transmission gearcase, C the transmission dynamometer, D the case containing the worm gear under test, E the Alden brake and F the platform scale which measured the load on the Alden brake.

The apparatus was so arranged that as the load was imposed the weight on the platform scale was removed and all vibration of the scale beam was eliminated by interposing springs S between the blocks FF, which sustained the weight on the scale, and also by suspending by a wire from the weight at the end of the scale beam a plate which dipped into a pail of oil, thus acting as an efficient dashpot. It was found possible by careful manipulation to maintain a steady and easily read load on both the transmission and absorption instruments.

The transmission dynamometer and brake were first compared by arranging them as shown in Fig. 1, in which position runs were made at various loads, and the torques corresponding to horsepower at 100 revolutions a minute marked on the dial of the transmission instrument corresponding to similar loads as indicated on the brake. It is evident that by this method of comparison the two instruments must check each other exactly.

A thermometer placed in the oil well at the back of the worm gearcase D indicated the temperature of the oil, and another thermometer placed on the wall near the apparatus indicated the room temperature.

The oil employed to lubricate the gears was one intended for use with superheated steam, having a specific gravity of 26 Baume, flash point 625 Fahrenheit,

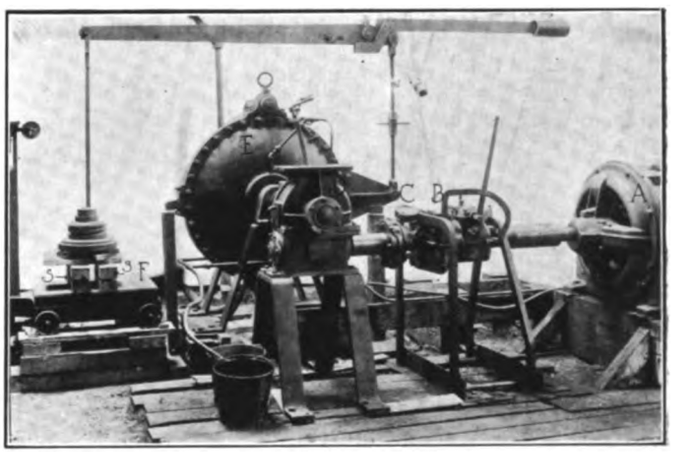
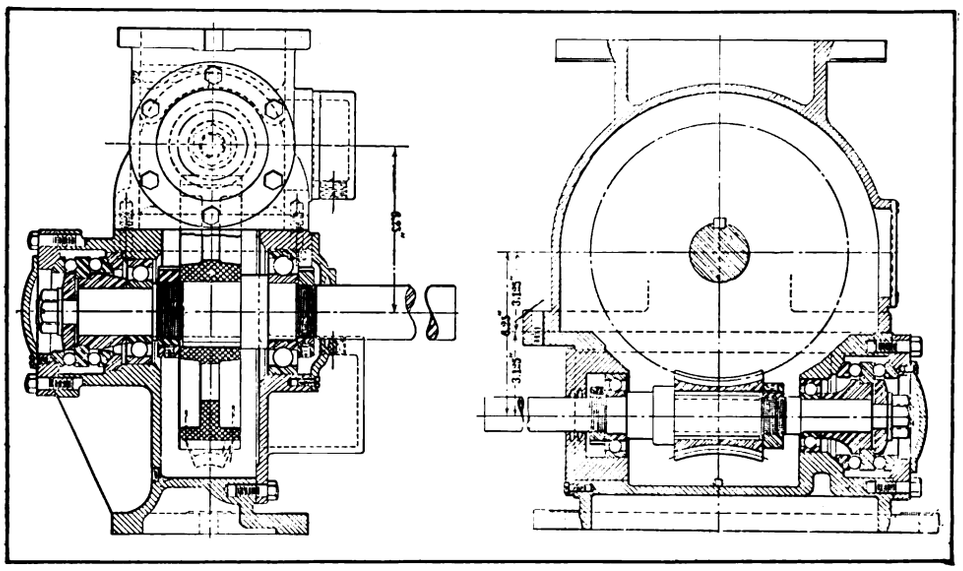


Fig. 2—Entire Apparatus Installed Ready for Testing Worm Gear Efficiency.

and viscosity at 212 degrees 260 to 265. The case contained about five quarts of the oil.

In all the trials the worm was located underneath the gear. Figs. 3 and 4 show sections through the

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Figs. 3-4—Sections Through the Gear Case.

gearcase. As indicated, both shafts are mounted on ball bearings and end thrust ball bearings take care of the thrust on the worm and worm wheel. All the worms were made of machinery steel, case hardened, and the worm wheels were of phosphor bronze.

The first worm and wheel tested are shown in Fig. 5, and are similar to those used for driving the spindle on the Brown & Sharpe automatic spur gear machines. This pair of gears is an unusual case of the worm and worm wheel. The smaller gear is hobbed with a hob of the size of the larger gear, thus making possible adjustment of the larger gear, which would not otherwise be the case. While in appearance this gear resembles a Hindley worm, it is not such in reality.

Although not strictly in accordance with usage, the smaller gear will be called the worm and the larger the worm wheel in the following description. Figs. 5 and 6 give the dimensions and a good general idea of this pair. The worm wheel was cut with the cutter shown, and the shape of the teeth on a section through the worm and worm wheel, parallel to the axis of the worm, is also shown.

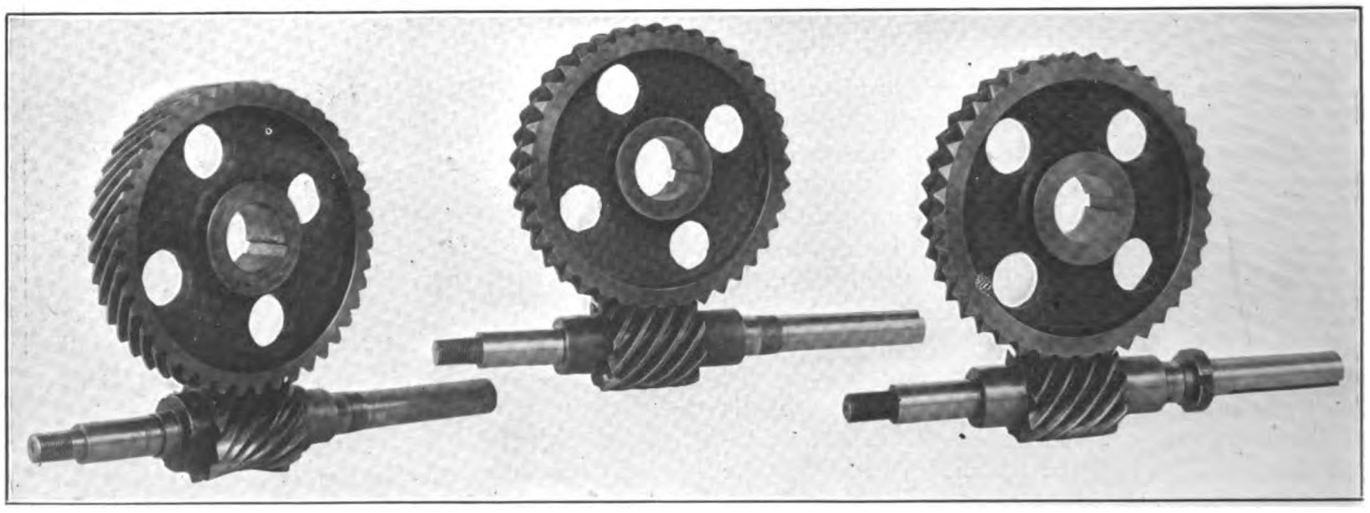
All necessary information pertaining to pairs No. 2 and 3 is given in Figs. 7, 8 and 9. The difference between gears 2 and 3 is principally one of shape of the worm threads. This difference is clearly brought out in the sections of the worm and wheel shown in Figs. 10 and 11.

The shape of the teeth on the worm in Fig. 10 was produced with a cutter, the included angle of which was 29 degrees, and the depth of tooth .57 inch. This depth was based on the axial pitch, while the usual method of multiple worms is to base the depth on the normal pitch. The object in using this cutter was to obtain as many teeth as possible in contact at one time, and also a shape that could be ground with a straight sided emery wheel.

The teeth of the worm in Fig. 11 were cut with a cutter shaped as shown, which is an arbitrary shape made to produce at one instant the greatest effective breadth possible as shown in the figure.

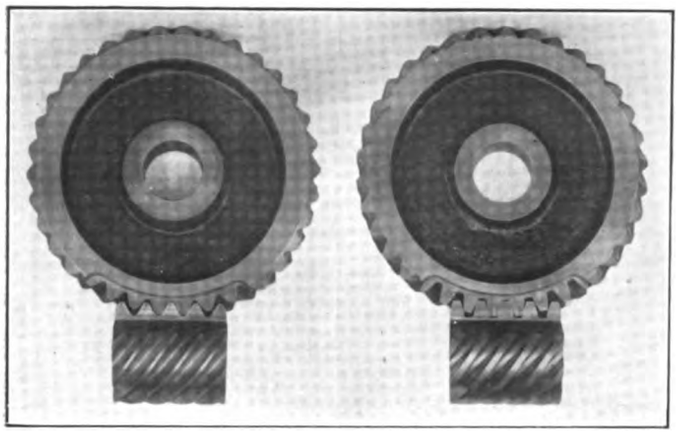
In conducting the trials the load was maintained at the desired point by one observer who adjusted the brake. Readings were then taken on the transmission instrument by two independent observers. The speed of the motor was observed in each case and from this, knowing the gear ratio, all the other speeds were easily computed. Temperatures were taken immediately following each series of observations.

For purposes of comparison a series of trials was run on a pair of bevel gears, the principal dimensions of which are shown in Fig. 12. Table 1 is a record of one set of observations typical of the series. Table 2 is a summary of the results of all the trials, and the curves of Fig. 13 show in graphic form the average efficiency of different gears at various loads and speeds.



Figs. 5-8-9—Worms and Worm Wheels 1, 2 and 3, Respectively.

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Showing Difference Between Pairs 2 and 3, Respectively.

In conjunction with the efficiency trials a series of runs was made to determine the heating effect due to continuous running. In these trials, which were in effect endurance tests, a constant load was transmitted through the gearing and the temperature of the oil in the gearcase and the temperature of the room noted at frequent intervals.

From these observations it was found that at the beginning of the run the oil temperature rose rapidly and somewhat irregularly. As the run continued, however, the rise became much more gradual and regular. In the runs where the smaller amounts of power were transmitted a point was reached where the temperature remained constant. This indicated that radiation was sufficient to carry away the heat due to power lost through friction in the gearing, or in other words, that the gears would run indefinitely at the load. The heat curves of the No. 1 worm and gear are shown in Fig. 14.

The higher loads indicated were abnormal for the gears under consideration and would not occur in any use to which the gears would normally be put. The fact that these trials continued for from 60 to 80 minutes without failure indicates that the structure is both strong and enduring and that should such temperatures be reached for any accidental reason the gears would not be destroyed. The result of the trials was of particular interest because of the very high efficiency and carrying capacity of the gears tested.

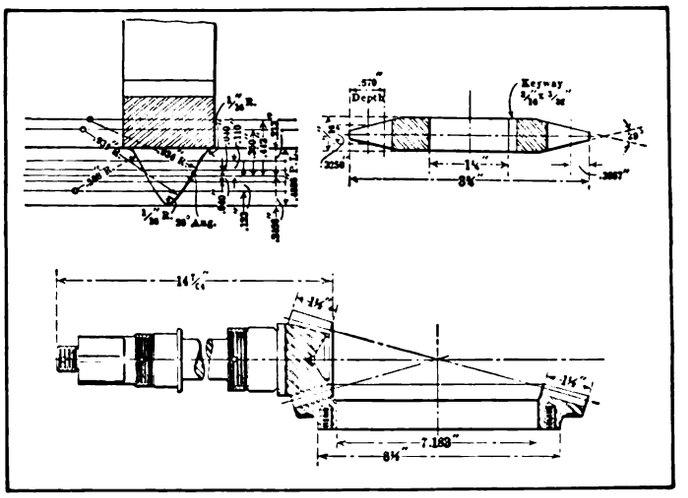
Every possible precaution was taken to secure accuracy in the results, and the high degree of accuracy obtained is due largely to the skill and care of B. F. Waterman of the Brown & Sharpe Manufacturing Company, under whose personal supervision the apparatus shown herewith was erected and all the trials were conducted.

Number of Groups of Readings Taken in Table 2.

	Gear No. 1	Gear No. 2	Gear No. 3	Bevel Gear
First speed	4	5	5	3
Second speed	4	5	5	6
Direct	3	5	5	5

Total separate readings, 165.

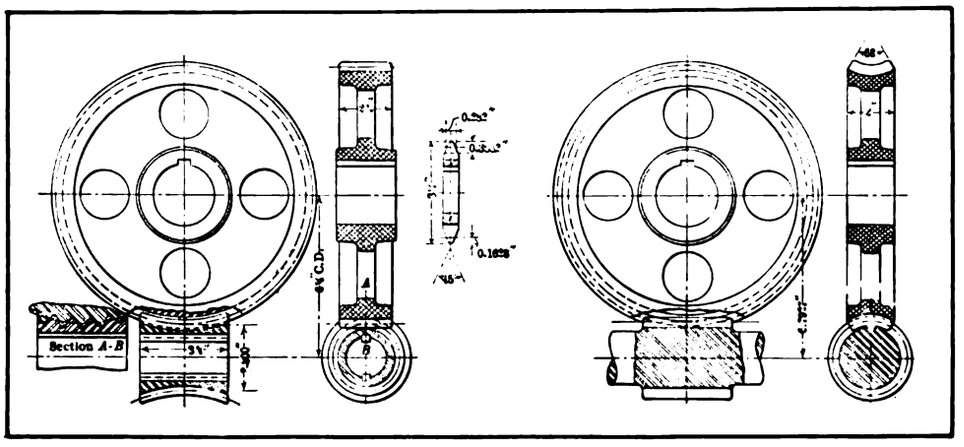
In connection with the illustrations accompanying this report, it should be stated in explanation of Fig. 6 that the worm wheel is of phosphor bronze. The number of teeth is 43, left hand; pitch diameter, 10.95; outside diameter, 11.28; circular pitch, .8; angle of teeth with axis, 45 degrees; normal circular pitch, .5657; pitch of cutter, 5.553; addendum, .1628 (not standard); thickness of tooth, .282; whole depth, .3882; included angle of cutter, 45 degrees.



Figs. 10-11-12—Sections Through Pairs 2 and 3, and Sketch of Bevel Gears Tested.

A similar explanation of Fig. 7 is offered as follows: Worm wheel, phosphor bronze; number of teeth, 40; pitch diameter, 10.5704; throat diameter, 10.9964; circular pitch, .8302; angle of teeth with axis, 38 degrees 16 minutes five seconds; normal circular pitch, .6518; pitch of cutter, 4.8196; addendum, .213; thickness of tooth, .3568; whole depth, .4586. Worm, Aurora Street, case hardened; number of teeth, nine; pitch diameter, 3.015; outside diameter, 3.441; circular pitch, 1.0524; angle of teeth with axis, 51 degrees 43 minutes 55 seconds; thickness of tooth, .295; lead, 7.4719; ratio of wheel to worm, 40 to nine.

With reference to Fig. 12 the following is presented: Driving pinion, 5 per cent. nickel steel, case hardened;



Figs. 6-7—Worm and Worm Wheel 1, and Worm and Worm Wheels 2 and 3, Respectively.

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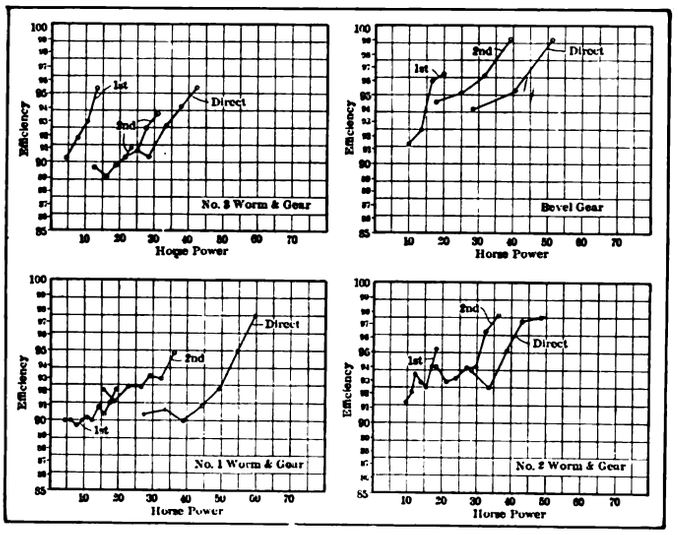


Fig. 13—Charts Showing Average Efficiency of Different Gears at Various Loads and Speeds.

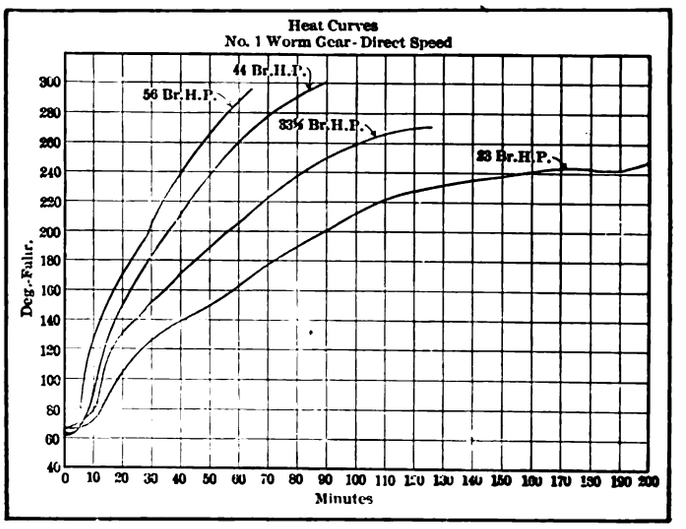


Fig. 14—Chart Showing Heat Curves of Worm and Gear 1.

pitch, five; number of teeth, 14; angle of edge, 15 degrees four minutes; angle of face, 71 degrees five minutes; outside diameter, 3.3359. Driving gear, 5 per cent. nickel steel, case hardened; pitch, five; number of teeth, 52; angle of edge, 74 degrees 56 minutes; angle of face, 13 degrees 47 minutes; outside diameter, 10.4627.

It may be added that the cutting of worm gears and the solving of their problems are not new to the Brown & Sharpe Manufacturing Company.

R.P.M. Motor	R.P.M. Worm	R.P.M. Worm Gear	Speed of Worm in Ft. per Min.	Initial Load	Reading on Scale	Load on Brake 315 Ft. Radius	H.P. per 100 R.P.M. Brake	Total Brake H.P.	Total Trans. Dyn. H.P.	Efficiency of Worm Gears	Transmission Dyn. Reading 1	2	3.	Av	Temp. at End of Test Oil	Room	Time Start	Fin.	Duration
875	875	196.9	690.7	104	55	49	24.5	48.24	49.26	97.9	5.6	5.65	5.65	5.63	268	65	10:14	10:20	6
873	873	196.4	689.1	104	60	44	22.0	43.22	44.35	97.5	5.1	5.05	5.1	5.08	273	65	10:20	10:25	5
880	880	198.0	694.6	104	65	39	19.5	38.61	40.92	94.4	4.7	4.65	4.6	4.65	276	66	10:25	10:30	5
880	880	198.0	694.6	104	70	34	17.0	33.66	36.26	92.8	4.15	4.1	4.1	4.12	275	66	10:30	10:33	3
883	883	198.7	697.0	104	75	29	14.5	28.81	31.17	92.4	3.55	3.55	3.5	3.53	273	66	10:33	10:37	4

	Gear No. 1							Gear No. 2							Gear No. 3							Bevel Gears						
	R.P.M.		H.P.		Temp.		Eff.	R.P.M.		H.P.		Temp.		Eff.	R.P.M.		H.P.		Temp.		Eff.	R.P.M.		H.P.		Temp.		Eff.
	Worm	Worm Wheel	Input	Output	Oil	Room		Worm	Worm Wheel	Input	Output	Oil	Room		Worm	Worm Wheel	Input	Output	Oil	Room		Pinion	Gear	Input	Output	Oil	Room	
First Speed	254.2	65.03	26.18	24.06	206	73	91.9	254.7	57.32	19.26	18.34	164	69	95.3	254.1	57.19	18.75	18.30	136	79	95.5	254.2	68.43	20.92	20.19		70	96.6
	254.6	65.13	24.75	22.47	217	73	90.8	254.7	57.32	17.99	16 91	169	69	94.1	254.8	57.33	16.54	15.48	144	79	93.1	254.5	68.51	17.50	16.78		70	95.9
	254.5	65.11	22.98	20.81	225	73	90.5	254.5	57.25	16.73	15.46	162	68	92.5	255.0	57.38	13.75	12.62	149	79	91.8	256.1	68.95	14.54	13.44		69	92.4
	255.1	65.25	21.17	19.25	228	73	90.9	254.3	57.22	15.08	14.02	142	69	93.1	255.4	57.47	10.80	9.77	150	79	90.5	256.5	69.05	10.95	10.61		70	91.4
	255.3	65.30	19.56	17.63	232	73	90.1	255.1	57.39	13.52	12.63	159	69	93.5	255.6	57 52	7.38	6.90	149	79	93.6							
	255.7	65.41	17.76	16.02	233	74	90.2	254.9	57.35	12.14	11.18	160	69	92.2														
	255.9	65.48	16.00	14.41	233	74	90.1	254 8	57.34	10.69	9.75	160	69	91.4														
	256.3	65.60	14.34	12.79	233	74	89.4																					
	256.5	65.62	12.37	11.15	231	74	90.2																					
	256.8	65.69	10.55	9.53	229	74	90.2																					
Second Speed	545.2	139.5	43.48	41.16	178	73	94.8	544.2	122.4	36.95	36 11	178	70	97 7	543 2	122.2	38.59	36.06	204	77	93.4	541.8	145.0	39.64	39.37		67	99.3
	546.9	139.9	40.54	37.78	207	70	93.0	545.0	122.6	34.61	33.10	184	70	95.6	543.8	122 4	35.36	33.04	215	77	92.4	544.1	146.4	33.43	32.22		67	96.4
	547.8	140.1	36.88	34.33	214	70	93.2	546.7	123.0	32.09	30.14	188	70	93.9	544.8	122.6	33.12	30.03	219	77	90.7	545.7	146.9	26.25	24.98		67	95.2
	548.8	140.4	33.47	30.89	217	70	92.3	548.4	123.4	28.90	27.15	187	70	93 9	545.8	122.8	29.82	27.02	221	77	90.6	548.5	147.6	18.75	17.72		67	94.5
	550.2	140.7	29.76	27.44	218	70	92.3	549.0	123.5	25.80	24.08	186	71	93.3	546 5	123.0	26.70	23.98	222	78	89.8							
	550.5	140.8	26.01	23.94	218	71	91.3	549.6	123.7	22.59	21.03	163	70	93 1	547.2	123.2	23.56	20.95	222	78	88.9							
	551.1	141.0	22.22	20.45	217	71	92.0	551.0	124.0	19.12	17.98	163	70	94.0	548.3	123.4	20.02	17.89	221	78	89.4							
Direct	859.5	219.8	66.43	64.86	178	69	97.6	873.5	196.5	49.35	48.14	265	66	97.5	866.0	194.8	49.95	47.72	215	77	95.5	872.0	234.7	52.05	51.63		70	99.2
	864.5	221.1	62.89	59.71	201	70	94.9	875.0	196.9	44.50	43.30	256	65	97.3	868.2	195.3	45.68	42 98	223	77	94.1	878.6	236.6	42.09	40.22		70	95.5
	871.0	222.8	59.23	54.60	214	70	92.2	878.0	197.5	40.40	38.50	260	66	95.2	870.8	195.9	41.20	38.20	228	77	92.7	884.4	238.2	30.40	28.58	132	79	94.0
	874.5	223.7	54.22	49.22	224	70	90.8	881.0	198.2	36.40	33.70	261	66	92.4	874.0	196.7	36.88	33.45	230	77	90.6							
	878.0	224.6	48.60	43.80	230	70	90.1	883.4	198.8	30.73	28 84	262	66	93.8	876.0	197.1	31.45	28.60	230	78	90.9							
	882.0	225.6	42.25	38.36	233	70	90.8								878.8	197.7	26.45	23.73	229	78	89 7							
	884.0	226.1	36.24	32.79	237	71	90.5																					

Table 1, Above, Efficiency Test of No 2 Worm Gears When on Direct Speed; Table 2, Below, Worms and Wheels and Bevel Gears, Average Efficiencies Taken.

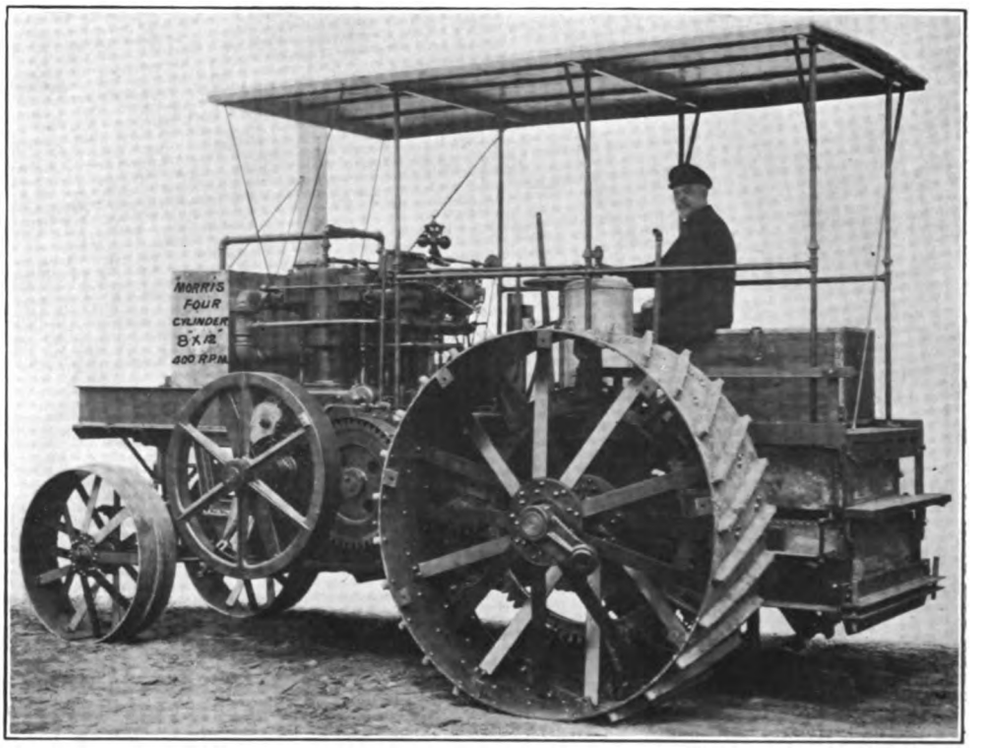
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THE MORRIS "LOW DOWN" TRACTOR.

TO JUSTIFY the cost of labor-saving machinery it must be operated as nearly continuously as is possible, or it must be so large an economy that the saving by its use for a comparatively brief period will impel its purchase. Machinery is usually built for service, and purchasing is generally a business proposition. This application may be made with reference to agricultural equipment, and it may be stated that where farms are of considerable proportions large economies have been realized through the planting and harvesting of crops. While the time actually in service may be comparatively brief, the periods are restricted by the seasons and productive work must necessarily be performed within them.

Work of this character must be expedited from every point of view and labor that can be applied with the least diminished result is decidedly the most profitable. Those operating large farms have utilized differing forms of machinery, power being approved because of its greater capacity when contrasted with the work of animals. Farming operations on small areas may show material profit, but it is with farm work on a large scale that machines yield the greatest economy.

Manufacturers of farming machinery have within recent years developed power equipment with extreme care. The perfection of the gasoline engine has made this prime mover the most approved power source of the day. The tractor has replaced animals to a certain extent because of its large capacity for haulage, and while its limitations because of surface conditions are manifold, it is entirely practical to utilize it for other work that extends its period of usefulness over a considerable portion of the year.



Left Side of Morris Tractor, Illustrating Forward Suspension and the Belt Pulley Utilised When Serving as a Power Plant.

There is no question, however, that the tractor adapted for farming requirements may be utilized in certain forms of construction, and particularly in highway building, and it is not at all unreasonable to assume that it will, with adaptation for road work, be used for hauling heavy loads on the roads.

The Morris "Low Down" tractor, built by George W. Morris, Racine, Wis., is a development in road and farm tractors that has many qualities that recommend it, these including sufficient speed, large power, sturdy construction and a design that permits of its being used for many purposes. It may be used for plowing and other work in planting, for hauling farm wagons or other forms of trailers, and it can be used quite as well on rough and uneven ground as on the roads. It is also practicable to use it as a portable engine for such work as power may be employed. The tractor is designed by Mr. Morris, who was for six years superintendent of the J. I. Case Threshing Machine Company's plant at Racine, and previous to that time was connected with the company for a considerable period.

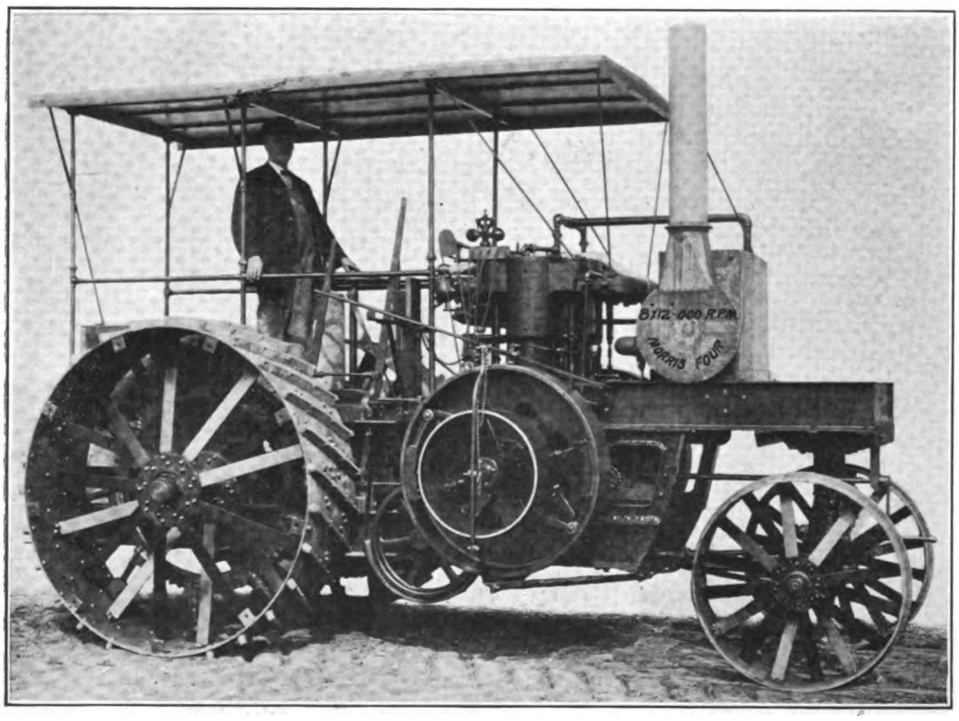
The "Low Down" incorporated with the name does not well serve the intent of the designer, who sought to establish the fact that the tractor has a comparatively low centre of gravity, a quality that insures a more satisfactory result on rough roads and fields. This reduction of the centre of gravity is secured by mounting the rear axle above the frame and carrying the chassis on helical springs, while the forward end is supported on similar springs contained in pistons. The tractor frame and the motor and system for transmitting the power are extremely strong and surprisingly simple, while the wheels have been made as light as appears practicable. These are a truss form with long hubs and wide wheel surfaces, the rear wheel rims or faces being fitted with diagonal cleats to afford traction in soft or shifting surfaces.

The tractor is driven by a four-cylinder, four-cycle, water-cooled vertical motor of the T-head type installed transversely in the chassis frame, and through gears the power is transmitted to the traction wheels. There is a gearset incorporated in the driving system

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so that there are two forward and a reverse speed ratios, and these are controlled by levers. As the motor is a slow duty type it is expected that it will produce the maximum power at 400 revolutions a minute for the largest sizes. The tractors are built with three sizes of engine—eight-inch bore and 12-inch stroke; seven-inch bore and 12-inch stroke, and 6.5-inch bore and 10-inch stroke. The ratings of these machines by the S. A. E. formula would be respectively 106.4, 78.4 and 67.6 horsepower, on the basis of 1000 feet piston travel a minute, but while considerably less than these figures is developed in actual power production there is no doubt that the motors will develop sufficient energy for all purposes. In fact there is a very large excess over normal requirements. The following description applies to the largest sized motor, but the other details are practically the same for all trailers.

The motor cylinders are cast in pairs and of a fine quality of gray iron, with unusually large water jackets that are self-draining when the drain cock in the delivery pipe from the circulating pump is opened. The cylinder heads are bolted to the cylinder units, asbestos copper gaskets making a tight contact of the members. There is a circulation of water through the centre of the cylinder heads. The engine base is a semi-steel casting of unusual strength, this being divided by two central webs which serve as a base for the centre main bearing, and it is in two sections, the upper and the lower. The lower section carries the flanges by which the motor is installed in the tractor chassis. The pistons are of a fine gray iron, are of unusual length, and are fitted with three rings above the wristpin and one below.



Right Side of the Morris Tractor, Showing Flywheel Containing Friction Clutch by Which the Machine Is Driven.

The crankshaft is a nickel steel forging with the middle bearing 4.5 inches diameter and five inches length, with the end bearings the same diameter and extreme length, these being supported by webs at the ends of the crankcase. The crankpins are 3.75 inches diameter and four inches length. The main bearings are a fine quality of anti-friction metal. The connecting rods are steel drop forgings with the big ends fitted with bronze cages containing bearings of a fine quality of metal, these being retained by bolts, lock nuts and cotter pins. The small ends are fitted with phosphor bronze bearings pressed into the eyes in the rods by hydraulic pressure. The wristpins are of hardened tool steel and are secured by set screws. The camshafts are of special steel, are carried on three bearings of large size and are driven by gears from the crankshaft. The cams are hardened and ground and are adjustable by conical fittings, clamp retained.

The valves are large, with gray iron heads into which the stems are screwed and secured by shrinking. The lower ends of the stems are fitted with means of adjustment for wear. The tappet rods are steel, carefully ground, and the yokes at the bases carry hardened steel rollers that engage with the faces of the cams, eliminating all side thrust. The lubrication is by a rotary gear driven pump that forces oil from the reservoir in the engine base and ejects streams of lubricant on the main and crankpin bearings, the centrifugal movement of the cranks throwing off the oil that is necessary to lubricate the timing gears, cams, tappets, connecting rods and wristpin bearings (oil ledges within the pistons insuring a sufficiency of oil for the bearings), and the piston and cylinder walls. The quantity of oil is indicated by a sight gauge.

The motor is cooled by water that is circulated through the water jackets by a rotary pump of large capacity and the water is cooled in a radiator that it is claimed will not freeze, mounted forward of the motor. This system is maintained to be adequate at all times.

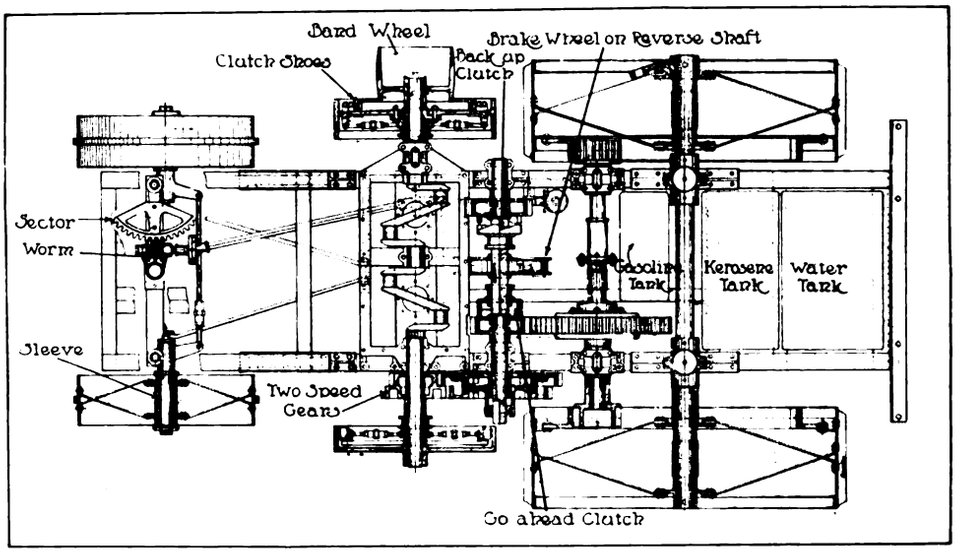
The carburetion of the fuel is ingeniously provided, as it is intended that this motor shall be driven by gasoline, kerosene, naphtha or distillate. With kerosene two fuel tanks are necessary, one of 60 gallons for the kerosene and one of 20 gallons for the gasoline. The motor is first started with gasoline and then that fuel is shut off and the other used. The carburetor is Mr. Morris' invention. In it the kerosene is vaporized by heat and mixed with a sufficient volume of vapor of water to insure combustion and prevent carbonization. The carburetion is maintained to be very ef-

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ficient and to afford a uniform and satisfactory mixture. The burned gases are exhausted into a very efficient muffler.

The ignition is by a low-tension magneto and a transformer coil, with a battery for starting and as a reserve. The operation of starting is to turn the engine one revolution with a starting crank to insure compression, after which it is fired by pressing a button. After the engine has been warmed the fuel is changed and with the change water is admitted to the intake manifold to insure the carburetion of the heavier oil.

The crankshaft projects at either side and at the right is a flywheel, and on the outboard end of the shaft is a belt pulley that is driven by a friction clutch acting on the inner periphery of the rim. When the machine is used for power production the drive is by a belt off this pulley, and this clutch may be disengaged so that the engine may continue to run but the power be not utilized. On the left end of the shaft is another flywheel. Sliding on this shaft is a sleeve connected with a friction clutch that acts on the inner periphery of the flywheel. On this sleeve is a spur gear of two different diameters. Parallel with the engine shaft, transversely in the chassis, is a countershaft. On the right end of this are two pinions, the teeth of which mesh with those of the gear on the sleeve of the crankshaft. These pinions are idle on the shaft. Between them is a sliding clutch on a sleeve that moves on a squared end of the shaft. As the clutch between them is in neutral it may be changed from high to low by moving a lever.



Plan View of the Morris Tractor with Sectional Illustration of the Method of Driving the Machine.

The countershaft carries a loose pinion that may be fixed by a sliding clutch, and a similar clutch that is made operative through a lay shaft beneath it and by which the reverse movement of the tractor is obtained. When the driving pinion is fixed this operates a large gear on a second shaft. In this gear is incorporated the differential. On the ends of this shaft are pinions that mesh with the gears carried on the tractor wheels and by which the power of the engine is exerted. The friction clutch in the flywheel has shoes of wood, which may be renewed by a man without a knowledge of mechanics. The clutch may be engaged easily and the power exerted so as to move the tractor with great exactness. There is a brake on the countershaft by which the machine may be controlled.

The control is by a hand wheel and levers, the tractor being steered with a worm and sector. The front of the frame carrying the engine and its auxiliaries is carried on springs and the jars and jolts of ordinary movement are practically nullified. The relation of the front axle is maintained by radius rods that are pivotally attached to a cross member of the frame.

As may be noted from the illustrations the frame is dropped back of the forward wheels and on this, to clear the rear axle, a platform is built. On this is placed a tank, a chest for tools, supplies, etc., and on it the engineer stands and operates the machine. The floor is removable to afford access to the mechanism below it. The tractor is fitted with stanchions for spreading a canopy that covers it from the front of the motor to the back. Ahead of the canopy is the radiator and the exhaust stack, the latter being straight into the air.

Great care was taken in designing the tractor to insure sufficient strength and to secure wearing qualities. The wearing parts are all provided with means for abundant lubrication, and with the wheels, gears, pinions and moving members the oil chambers are such as to insure against lack of lubricant even when practically the minimum of attention is given to this matter.

The tractors have a maximum speed of about four miles an hour and can draw very large loads with trailers or can be utilized for plowing, and other forms of cultivation. They have in trials drawn eight 14-inch gang plows, turning alfalfa sod to a depth of seven inches. When the ground on which work to be done is soft the width of the traction wheels can be considerably increased.

Besides farm work these machines have been and are adapted for use for driving threshing machines, saw mills, shingle mills, pumping machinery, road graders, stone crushers, and for purposes where it is desirable that the power be sufficient and yet easily transported.

In order to meet heavy demands in 1913 for both its pleasure and commercial lines, the Michigan Buggy Company, Kalamazoo, Mich., has found it necessary to further enlarge its factory. Ground is being broken for the erection of a building which will provide 50,000 additional feet of floor space.

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ELECTRIC TRUCKS AT NEW YORK DISPLAY.

THE Electrical Exposition and Automobile Show of 1912, conducted by the Electrical Show Company, which was inaugurated at Grand Central Palace, New York City, the evening of Oct. 9, and was concluded Oct. 19, was in every way successful and productive of good results. The exhibition attracted a very large attendance each day and there was unusual interest manifested. First of all the show was unusual in that it had as features an extremely large number of exhibits from departments of the national government, each of which was well worth the attention of the visitors, and these were supplemented by an excellent department devoted to the display and the demonstration of electric vehicles, to say nothing of many scientific, industrial and economic exhibits, in all of which the value of the use of electric energy was shown.

Grand Central Palace, where the exhibition took place, is designed for large public displays of this character, and the mammoth apartments were made unusually attractive by decorations in which electric lights were the principal feature. The exterior of the building was illuminated at night with clever and striking designs of gleaming lamps. The exhibition was the sixth held in New York, the first being held in 1907 in Madison Square Garden, and it was decidedly the largest and most comprehensive of the series.



George Fox Parker, Manager of the New York Electrical Exposition.

There was additional interest given the show from the fact that its opening was an observance of the 30th anniversary of the starting of the first central station in the world by Thomas A. Edison, and it was significant in that it demonstrated the progression made during 30 years in the utilization of electric current. Not only this, the exposition was formally opened by Thomas A. Edison, whose inventions, more than of any other man, have made possible the use of a mysterious force for lighting, power and heating. In fact there appears to be little realization by the people of the world of the debt they owe to the master mind of the man long known as the "Wizard of Menlo Park."

But prior to the opening of the show there was a tribute paid to Edison at a complimentary luncheon tendered to him by the New York Edison Company, at which was present a company of about 400 men, among whom were some of the leading scientists, financiers, manufacturers and professional men of New York and vicinity. The gathering was noteworthy in that those present were men of potent influence in the community, state, nation and the world's industrial, commercial and scientific life, all of whom understood what a marvellous development has resulted from the little station in Pearl street, New York, established by Edison three decades before. It was Edison who placed at the disposal of mankind the wonderful forces of electricity. Among those present were men who had witnessed day by day the increased utilization of electric power, and there was review of the activities of the company which has been regarded as first in electrical progression throughout the world. The luncheon was served in the banquet hall and it was followed by the formal opening of the show by Mr. Edison.

Of course, the real feature of the decorations were the lights. These were used in every conceivable manner and as a spectacle the show was especially interesting. In all there were 118 exhibitors, whose displays were arranged on the main and balcony floors, while on the second balcony floor was the demonstration track for electric vehicles. The national government co-operated with the management of the exhibition to the extent of showing some displays that were of peculiar interest. These included examples and apparatus used in medical research by the Department of Agriculture, an exhibit by the census bureau of the Department of Commerce and Labor, others by the bureau of mines and the reclamation service of the Department of the Interior, the Smithsonian Institute, the Navy Department, the War Department, the Isthmian Canal Commission, and by New York State. It is needless to say that these had great attraction for the visitors, especially the model of the great Gatun dam of the Panama Canal and the naval wireless telegraphy installation.

The show from the viewpoint of those interested in electric vehicles was admirable, and while these were not shown in a department devoted exclusively to them they were all seen on the main floor, the pleasure cars and service wagons being arranged to best meet the desires of the exhibitors. Because of limited space and the fact that it was believed wise to develop as widespread interest as was possible some of the exhibitors displayed both carriages and wagons, but it is interesting to note that of the 12 firms represented but four showed pleasure vehicles, while all but two had at least one model of wagon or truck.

The fact that nine of the exhibitors had displays at Boston may have necessitated dividing the show vehicles between the two, and this may have somewhat limited the number shown, but nevertheless the department was decidedly representative. In all 35 machines were displayed, of which 13 were pleasure types and 22 were for service purposes. The industrial wag-

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ons ranged from the light runabout with special equipment to the five-ton truck, but the majority ranged from 1000 pounds to two tons, these being the capacities that are especially desirable for small business houses and those who require comparatively quick delivery. In addition to these were shown several industrial trucks intended for use in handling shop and factory products, freight, and the like, these being driven by electric power and having capacities ranging to 3000 pounds.

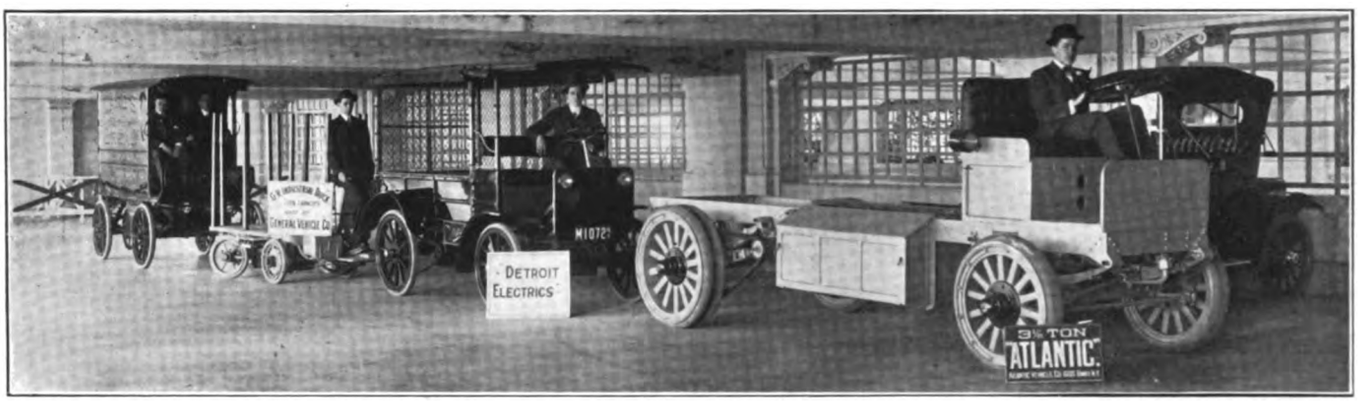
Of course the vehicles were the latest types and represented the highest quality produced by the makers, and aside from one loaned by the owner all were new. Naturally those with body equipment were admirably finished and intended to attract attention because of appearance wherever seen. There were no restrictions upon the movement of vehicles in the building and the visitors found much to interest them on the second balcony floor, where a demonstration track, 20 feet in width and 528 feet to the circuit, had been laid out. This was used for demonstrating purposes and here any person who desired could have the machines set apart for trials practically shown to them.

ment that it decided on the more elaborate facilities for demonstration employed at the show just closed. The indoor trials of machines, apart from traffic and confusion, cannot be too highly valued. But it should be understood that the buyers of service equipment demand considerable periods for observation and are not inclined to be guided by the mere handling of the machine. A number of the exhibitors kept vehicles in the enclosure within the track and these were shown as often as desired.

The exhibitors of vehicles were as follows:

Anderson Electric Car Company, Detroit, Mich., showed a two-ton Detroit Electric wagon on the demonstration track and three chassis of 1000, 2000 and 3000 pounds capacity, as well as a roadster, coupe, brougham, victoria and limousine at the stand. These were all the latest productions and the brougham was shown for the first time.

Atlantic Vehicle Company, Newark, N. J., displayed on the track a 3.5-ton Atlantic truck chassis, this being next to the largest size of the standard design vehicles produced by this concern. At the stand was exhibited a one-ton wagon chassis, this being the



Some of the Service Wagons That Were Shown to Investigators In Actual Operation—Photo by Photographic Bureau, New York Edison Company.

This section of the show was under the direction of the Electric Vehicle Association of America, representatives of the New York branch being present during the show for the purpose of informing all who wished facts concerning any machine or of its service or operation. For the benefit of the women visitors Mrs. Alice E. Waxham, who is a professional instructor in electric carriage driving, was in attendance to give information and expert assistance to all who wished to obtain experience preparatory to handling machines. The track was defined by a hedge at either side, and within the park was a small charging equipment with capacity for four batteries at a time, this being used to charge the batteries and to illustrate the installation that would be necessary in a modest private garage, or a part of what would be needed in a station for a delivery service or public station. With opportunity for observation and with all data available at inquiry this division of the show served a specially useful purpose.

At the show last year a similar track was used with admirable results, and so satisfied was the manage-

smallest machine that has yet been produced.

Baker Motor Vehicle Company, Cleveland, O., showed two Baker service vehicles, the one being the bevel gear shaft driven runabout of 500 pounds capacity, a machine that has been produced for about two months, and a two-ton chassis, this being the standard type that has been delivered very largely to express companies. The display of pleasure cars included a wheel steered brougham, a coupe and a victoria.

S. R. Bailey & Son, Inc., Amesbury, Mass., exhibited a single model, this being a Bailey roadster especially designed for quick service, it having a speed of 20 miles an hour and a carrying capacity of 500 pounds. Machines of this type have been driven 80 miles in four hours.

Champion Electric Vehicle Company, Oswego, N. Y., showed two service models, the one being a machine of 1000 pounds capacity, driven by shaft, and the other a one-ton wagon with double chain reduction. The former is claimed to be from 500 to 750 pounds lighter in weight than many standard types of like

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capacity. In this model the battery is under the seat and the steering column, with control lever beneath the wheel, is at the left side. The front axle is I section and the rear axle housing is pressed steel and the chassis frame is a stout channel section. The mileage is rated at 50 to the charge.

Cleveland-Galion Motor Truck Company, Cleveland, O., exhibited several of the dynamic industrial trucks, intended for use in railroad or steamship terminals, warehouses, mills, factories, etc., which have one-ton capacity. These trucks are driven by and steered with all four wheels and may be even driven sideways, which facilitates quick handling of material transported.

Buffalo Electric Vehicle Company, Buffalo, N. Y., made display of three pleasure cars, one a runabout and the other two coupe types. This concern is preparing to place in the market a complete line of service wagons, but no model is ready for demonstration as yet.

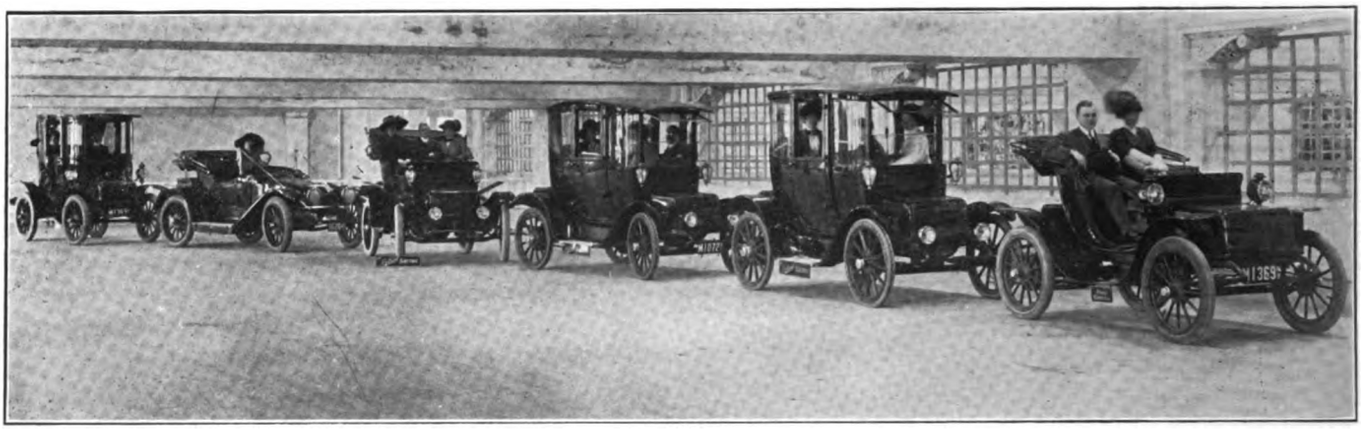
General Motors Truck Company, Pontiac, Mich., showed a five-ton G-M-C chassis with the wheels jacked from the floor that the method of control could be the more easily demonstrated. This is the largest electric machine yet produced by this concern, and it was the first of this size ever shown in the East.

General Vehicle Company, Long Island City, N. Y., exhibited at its stand a 3.5-ton G-V truck built for Arnold, Constable & Co., and a 1000-pound panel body wagon built for Black, Star & Frost, the former being an addition to a fleet of 14 General Vehicle wagons and the latter one of three ordered recently. An industrial truck of one-ton capacity was also displayed, while on the track were demonstruted two 750-pound wagons.

Lansden Company, Newark, N. J., showed a one-ton chassis that represented the latest Lansden perfections, including the numerous qualities that were described in the last issue of MOTOR TRUCK. The two-ton chassis is fitted with two forms of body equipment, the one being the ordinary express type. The other is adapted to demonstrating a machine for crowning or capping beer bottles, which machine is carried on the wagon. It is driven to the brewery or bottling establishment and there the machine is operated by current drawn from the vehicle battery. The 3.5-ton chassis is fitted with a tank and may be used for spraying highways with oil or water. The tank may be filled and the contents distributed uniformly and economically over a given area of highway, a 1.5 horsepower motor driven by the battery affording the necessary pressure in the tank to give the required feed. If needed for other purposes the tank may be removed and a body installed.

Studebaker Corporation, South Bend, Ind., had for exhibition a 1000-pound Studebaker chassis equipped with a panel delivery body, a two-ton 1913 chassis fitted with a stake platform body, and a five-ton wagon loaned by George Ehret on which was a body designed for brewery delivery by Louis Ehret.

Ward Motor Vehicle Company, New York City, exhibited two Ward machines, the one being a 1000-pound delivery wagon and the other a one-ton wagon, the first built for the delivery of bread, and the other designed for the general service of the Edison Electric Illuminating Company of Brooklyn, N. Y.



Several of the Pleasure Cars Awaiting to Enter the Demonstrating Track—Photo by Photographic Bureau, New York Edison Company.

Edison Storage Battery Company, Orange, N. J., made display of Edison batteries intended for railroad lighting, vehicle propulsion, and motor car ignition and lighting, as well as parts that compose Edison battery cells, and a direct connected General Electric charging outfit, an Edison alternating current rectifier and two voltage regulators.

Electric Storage Battery Company, Philadelphia, Penn., showed a comprehensive display of storage battery cells suited for lighting, vehicles, ignition and motor car lighting, and for use by central stations, and the latest type of end cell switch. Some forms of earlier construction were also shown.

Philadelphia Storage Battery Company, Philadelphia, Penn., exhibited the different sizes of battery cells it produces, showing the remarkable progress that has been made in lessening weight and increasing efficiency by a series of cells that were developed from time to time.

Gould Storage Battery Company, New York City, made exhibition of the different forms of storage bat-

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Ezra Meeker of Seattle, Wash., Touring the Country in Prairie Schooner of 1864.

teries it manufactures, these including ignition, motor car lighting, vehicle propulsion, house lighting, as well as components for batteries for submarine vessels and for central stations.

OXEN VS. ELECTRIC TRUCKS.

Famous Pioneer Discusses Relative Merits and Demonstrates That He Understands Both.

In 1864, Ezra Meeker, now of Seattle, Wash., crossed the plains in a prairie schooner drawn by a yoke of oxen. Of late he has been engaged in reviving interest in the relocation of the old Oregon trail, having started from Seattle in 1906, with his original prairie schooner, shown herewith. During the past six years he has driven oxen some 8000 miles, crossing and recrossing the country in what he calls an advertising scheme, purely and simply.

That this famous pioneer is interested in progressive means of transportation was indicated during his recent visit to Denver, Col., where the second picture was taken. Not only is he interested, but he is familiar with the modern electric vehicle, as is evident from the fact that he drove the G. V. wagon, owned and operated by the Denver Gas & Electric Light Company about the streets of Denver for some time during his stay in that city. He discusses the situation as follows:

"How easy pioneering would have been in old days if we had had the horseless system of transportation. I remember when the hauling in Denver and other pioneer towns was done mostly by oxen, and in those days we used to think we did a business of some volume. I am an old man with wide experience, and I think my judgment is worth something, so when I predict that the electric will eventually be the popular machine I am not talking through my hat, as the saying is.

"Just take, for instance, the price of gasoline. I see it has gone up. And isn't it going up more? Won't that make the business men think about the electric? Out in 'Frisco one of the electric fellows told me something about its cost. He told me how economical they were. It certainly stands to reason that an electric delivery system should be cheaper than any other. When you stop at a house your expense stops. There is no engine to keep going.

"Why, you may not believe it, but I myself know how to run one of your trucks. Do you know how long it took me to get the hang of the thing? Just half an hour. Now it looks to me that any common teamster could learn to run one of those machines in no time."

It was at the conclusion of this little speech that Mr. Meeker was invited to show his driving ability, and his picture was taken at the wheel of the G. V.



Ezra Meeker at the Wheel of G. V. Electric Wagon in Denver, Col.

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BOSTON ELECTRIC SHOW A SPLENDID SUCCESS.

THE exhibition of electric vehicles in connection with the 1912 Boston Electric Show was exceedingly creditable. In fact it is certain that it was the largest display of such machines ever made at any one time in America and perhaps in the world, and while it was representative in every way it did not indicate the enormous progression made by the industry so far as number of manufacturers is concerned. This was due to many reasons, chief of which is the unwillingness of many makers to engage in what may be termed promotion of the use of electric machines.

Relative to this aspect of the market it may be stated that there are many firms producing electrics whose officers believe it is ill advised to co-operate in the campaign of promotion inaugurated by the Electric Vehicle Association of America as their factories are limited as to production, the outputs can be disposed of without difficulty in comparatively small areas and without extraordinary selling expense, and they are content for the time being with the business in prospect without endeavoring to stimulate a general knowledge of the economy of electric transportation.



Chester I. Campbell, Manager 1912 Boston Electric Show.

This condition was realized by Day Baker, now treasurer of the Electric Vehicle Association of America, who visited a number of the manufacturers of the country during his vacation in an endeavor to create interest in the Boston show, and it was also experienced by W. H. Blood, Jr., who, as president of the Electric Vehicle Asociation of America, solicited contributions to the publicity campaign fund of the association. This statement is made for the purpose of showing that the firms that made exhibition did so largely from a viewpoint of co-operation with the central stations and to demonstrate the possibilities of the vehicles.

There is no doubt that the hundreds of thousands who visited the show were much impressed with the electric motor vehicles. It is not to be assumed that the visitors were all interested in the machines, but without question thousands who knew little or nothing of the capacities of the cars and trucks found much general and specific information, and those who have animal delivery equipment and are investigating transportation had available data that could not have been otherwise obtained save by the devotion of so much time that inquiry might not have been undertaken by extremely busy men.

The departmentalizing of the electric vehicles was natural enough in that it impressed upon the visitors the character and quality of the different exhibits, and afforded opportunity for comparisons which developed understanding and appreciation of the various types. So far as the pleasure cars were concerned there is no doubt that the excellence and elegance of these machines appealed to a very large class, for these are especially adapted to the requirements of city and suburban residents, and are so economical and enduring that for service in town and suburb they can be commended by all motorists. The service vehicles, however, interested those who have to consider all forms of highway transportation, and as these were practically of every type, from the 750-pound delivery wagon to the heavy truck, the logical machines for many forms of work were available for close examination and inquiry.

It may be stated that the length of the show from the viewpoint of the exhibitors was such that they could not give their entire time and attention to developing its possibilities, because of the demands of regular business, but as considered by the visitors it was decidedly advantageous as they could devote whatever time they desired, and especially evenings, to collection of information of decided value to them. There are those who may believe that a person concerned in the economic aspect of highway haulage can or will give whatever time is necessary to inquiry, but it is apparent that where every desirable fact is available at times when business duties are forgotten an interested person would make the most of an opportunity.

In connection with the show of machines the results of standardization were decidedly impressed upon the visitors. To illustrate: With many of the makes shown aside from size of components the vehicles are identical in design and construction. The smallest machine is exactly the same as the largest, and in each chassis is precisely the same number of parts, so that what may be stated of one size applies equally well to the others of the same make. This does not hold true of all machines shown, but to practically all of those making several sizes, and further than this there is no disposition by the makers to make changes. In fact one of the strongest arguments made is the continuance of a design from year to year, with perhaps refinements as to controlling or regulating devices, and the fact that there are no radical differences in the most recent productions and those built a year or two previous. It must not be assumed there are no progressions in electric wagon design, but it will be understood that the majority of the principal makes are developments from years of practical use

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and experiment, and are types that have been proven best adapted for general requirements.

As to the wagons as displayed it must be realized that these were but a very few of the possibilities so far as body equipment was concerned. While the chassis of a given maker may be identical in design, though they vary in size, the greatest difference may be made in appearance by the body installed. It is true that there may be uses in which the fine finish and handsome ornamentation of the show wagons would be superfluous and the cost could be reduced by dispensing with the decorating, but the majority of business men believe in making a consistent display with their delivery service, assuming that the prestige gained by making a good impression wherever the vehicles are seen is worth all the cost. This being so, the purpose of showing the advertising value of the wagons exhibited is obvious. Not only this, these machines emphasized to the visitors qualities that may have not previously been realized.

Many of the machines shown with body equipment have been or are to be placed in service in different cities and towns, and some of these were striking in appearance and could not fail to attract attention wherever seen. Of course the character and quality of the bodies does not affect the serviceability of the wagons, but it is certain enough that many men propose to realize all the advertising as well as the service value that electric vehicles will afford, a combination that can be commended by any business man.

But if there was any one fact established it was the surprising lack of knowledge of the electric car and wagon. Men who are in business in distant cities and towns devoted themselves to gathering information they believed might be beneficial. In many instances they were from localities where as yet these machines are not used, and yet there is no reason why they could not be as economically utilized as in the larger commercial centres. Some inquirers stated frankly that they could not expect to receive from men in their own lines information that would make them still greater competitors if they employed like delivery, and they found difficulty in gathering facts that they could logically apply to their own benefit. It was necessary to learn the conditions under which the particular business was conducted before it was possible to make suggestions, and to go into each inquiry sufficiently to establish a foundation for opinions was necessarily a lengthy process, and while this was imperative with many there is no question that the result was beneficial. This, of course, applies to service wagons only.

Another fact developed was that while there are numerous branches and agencies for machines in Boston the number in other sections of New England is comparatively few, and this was in a sense a limitation because the people from a distance do not regard with favor being dependent upon those whom they cannot reach as easily as they can the agents for other vehicles. By this is meant that a greater number of agents would better serve and more quickly interest people who favor electrics. In other words the activities of the agents are necessarily confined to the sections immediately contiguous to the cities in which they are located, and in the absence of representatives the people can not be expected to promote the use and sale of that with which they are unfamiliar.



A Section of the Automobile Park That Was Given Over to Service Wagon Displays.

A phase that was also worthy of attention was the supposition of many that an electric machine requires expert attendance. There is a belief very generally prevailing that the equipment for a privately maintained garage is costly and complicated, and that large experience is essential to afford desirable maintenance and care. The electric garage conducted in connection with the show was one of the best demonstrations that could be made that there is no foundation for such opinion, and that as a matter of fact the expense is comparatively small. Not only this, but when once equipped a station could be used with a very small expense for repair and upkeep for a long period. Further than this, it was shown that the tendency of the central stations is to reduce the cost of current and that with the greater production of energy and the increased consumption the price is invariably de-

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creased wherever the conditions have warranted.

This was emphasized by the Edison Electric Illuminating Company of Boston which at the time of the opening of the show established a new rate for charging and power current, bringing it to three cents a kilowatt-hour after the first 20 hours' service, which will make the cost for a full charge for a five-ton truck $1.185, this giving considerably more than the rate capacity of 35 miles, half of the distance carrying full load. Based on rated mileage capacity this means about 3.5 cents a mile for current consumed. With smaller vehicles the rate is at least proportionately less on the basis of mileage and battery capacity.

The value of a garage as a demonstration of possibilities was apparent, for its equipment and the methods were carefully investigated by many who were desirous of ascertaining the service and the attention afforded. In this were garaged a considerable number of machines of all types and sizes, from the six-ton trucks of the Boston Edison Company to the runabouts of some of the exhibitors, and while the greater part of these were in daily service the garage was well filled at night and the night force was extremely busy as a rule. The visitors had opportunity for following and observing the work of any given machine for as long a period as was desired, and to make notes or obtain any information that was sought. In the ordinary garage facts and information pertaining to organization, efficiency or results are seldom available, and are never open to the public as a whole, and in this the ideal electric garage was one of the best, if not the best, exhibits of the show. To be sure the data were based on the proportions and the equipment, and it may be said that the smaller service station is relatively more costly, but there is no decrying the fact that it served a decidedly useful purpose, to say nothing of the demonstration of the methods that were desirable in well maintaining electric machines.

The garage was conducted by the Atlantic Avenue Electric Garage of Boston, and was under the management of E. S. Mansfield, who is manager of that establishment. The system of caring for the wagons and trucks was the same and the work was performed under the direction of the foremen and their assistants. This statement is made to emphasize that the methods were entirely practical and have been found satisfactory in constant station service, and are such as can be imitated or adapted by any other concern. It may be well to state that the Atlantic Avenue Electric Garage is the only exclusive station, separate and apart from a central station service, in New England, given over to industrial wagons.

Viewed from any aspect the electric vehicle exhibition in connection with the 1912 Boston Electric Show was decidedly a success. There is no doubt whatever that it has been distinctly promotive of the use of machines and has brought to the direct attention of hundreds of thousands the practical utility of electric conveyances, as well as establishing conclusively the magnitude and importance of the industry. Another condition worthy of comment is that with the exhibitors there was a pronounced harmony, and each endeavored to impress upon visitors that a spirit of co-operation prevailed. There were numerous instances of salesmen and dealers turning interested inquirers to others, and with each it was a case of doing all that was possible and practical to promote the welfare of all.

There were several interesting exhibits shown that are deserving of special attention. One of these was the one-ton Lansden wagon that was delivered in 1904 to the Thomas A. Edison Company at Orange, N. J., and since that time has been in constant service. This wagon was driven from Orange to Boston by H. M. Wilson, and the current was supplied from a battery of 60 A-6 Edison cells which after 43 months' constant use in a department store service in New York was borrowed for the demonstration. The battery is one of the oldest of the Edison type in use and it was regarded as extremely efficient. On the return of the wagon to New York the battery is to be returned to the owner and again placed in the service in which it has been used.

Another object of interest was the 1000-pound Studebaker delivery wagon that has been for 3.5 years in the delivery service of the Christian Science Monitor and used for the distribution of newspapers about Boston. During the period stated the machine has been driven between 25,000 and 30,000 miles. This vehicle, with a panel body, was displayed mounted on a two-ton wagon chassis.

The first G-M-C wagon chassis built was also exhibited, the machine evidencing the service given it. It is stated that this chassis was driven 10,000 miles in six months, making trips between Detroit and Pontiac, Mich., with two crews alternating to thoroughly test the construction.

The big machines were the five-ton truck chassis shown by the General Vehicle and the Atlantic Vehicle companies, that of the former being an order that was delivered directly after the show to the Massachusetts Breweries, Inc., and which will be used for regular delivery. The Atlantic chassis is the demonstrator used by Charles D. Daly, who was famed as a quarterback for the Harvard and West Point football teams, and later fire commissioner of Boston, and who is now the representative of the company in Boston.

Some of the exhibitors that produce both pleasure and service machines showed but one type because of lack of space, and others were unable to procure a model of the service vehicles which they will in future distribute.

The show as a whole was exceedingly successful. The attendance averaged close to 40,000 daily, and it was estimated that approximately 1,000,000 persons visited the exhibition. There was abundant interest in the greatly diversified displays and there is no question that the result will be a very largely increased use of electric current in Boston and vicinity

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and the utilization of the innumerable devices and appliances that make for industrial and domestic economy.

The success of the display, when viewed as a



First Electric Truck Employed in Wholesale Paper Haulage—A 3.5-Ton Atlantic.

strictly business proposition, was due very largely to the fact that those in charge of the arrangements selected Chester I. Campbell as manager. The motoring public is well aware that Mr. Campbell has been manager of all the automobile, motor boat and aeroplane exhibitions in Boston, these being the largest and most successful displays of this character ever held. This explains the wonderful attention to detail which made the 1912 Boston Electric Show such a splendid success, although it by no means indicates the methods employed by Mr. Campbell. His study of this subject has been most thorough, and while the result seems simple of attainment when carried out by him, it would be difficult to secure the same management from other hands. That this is true is borne out by the fact that Mr. Campbell has been selected to head a committee of automobile show men engaged in carrying out a series of motor car exhibitions in the larger cities throughout the country this coming winter and spring.

ATLANTIC IN PAPER HAULAGE.

Eight of the Two-Ton Models Also Sold to the Adams Express Company in Philadelphia.

The policy adopted by the Atlantic Vehicle Company, Newark, N. J., maker of Atlantic electric vehicles, in which the engineering department volunteers to aid in the solution of haulage problems presented by those who are interested in installing the modern method of transportation, has been successful in opening up at least one new line of business endeavor to the electric vehicle. An accompanying illustration shows what is believed to be the first electric truck utilized in the wholesale paper business. This was purchased by the Maurice O'Meara Company, 448 Pearl street, New York City, after a thorough study of the question and a most careful investigation of the merits of the Atlantic. It is a 3.5-ton vehicle and has given excellent satisfaction.

The other illustration herewith presents a two-ton model, recently sold to the Adams Express Company of Philadelphia. It is one of a fleet of eight trucks of the same capacity sold to this concern. That express companies have been convinced of the simplicity, reliability and efficiency of this type of vehicle is borne out by the large orders which have been given to several makers of electrics during the past few months.

MOTZ GAVE GOOD SERVICE.

Laundry Proprietor Finds They Wear Twice as Long as Pneumatics in That Work.

Commercial vehicles in constant service over rough streets and roads furnish a decidedly severe test on tires. A large number of truck owners who have been using Motz non-skid cushion tires have been writing the maker, the Motz Tire & Rubber Company, Akron, O., concerning their experiences. One of the letters follows:

We have run our car since June 3, 1911. We have no speedometer, but think the car has been run between 5000 and 6000 miles.

These Motz non-skid cushion tires are the only tires with which I have had any experience, but a laundry in Harrisonburg, Va., which purchased a car equipped with pneumatic tires the same day I purchased my car, has nearly worn out two sets. From the trouble I see others having with pneumatic tires, I think the Motz tires last more than twice as long as the pneumatic tires under the same working conditions.

I prefer the Motz non-skid cushion tires, especially for delivery service. We have had unusually bad weather here—frozen, rough streets a good part of the time—and but for this I believe that my tires would yet be good for a long time. Only one on a rear wheel is practically gone. The other will be gone soon, but the front tires are very good.

So I can say for your tires that I am well pleased with them in every particular.

(Signed) W. R. BEETON,
Proprietor Lexington Steam Laundry, Lexington, Va.

More Trucks in Boston—The Jenney Manufacturing Company, Boston, Mass., has accepted delivery of a five-ton General Vehicle truck which is to be used in the delivery of gasoline about Boston and vicinity,



Two-Ton Atlantic Truck, One of a Fleet of Eight Sold to Adams Express Company, Philadelphia.

the electric vehicle being held to be especially adapted for service of this character because of its immunity from danger. The D. J. Cutter Coal Company has also placed a five-ton General Vehicle truck in service.

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WILLIAMS HEADS NATIONAL ASSOCIATION.

Convention at Boston Awakens Great Interest in a Body Already Having Great Industrial Influence---Practical Work to Promote a Market for Electric Vehicles and Current---Suggestions for Activities.

THE third annual convention of the Electric Vehicle Association of America, held in Boston, Mass., Oct. 8-9, was the largest and most profitable in the history of the organization. A majority of the members was represented and the proceedings were extremely interesting from every point of view. If there were comment it would be of the fact that there was not, in some instances, as much discussion as the excellence of some of the subjects presented deserved. This is not meant to imply that there was not keen interest, but there were so many possibilities for practical results arising from the suggestions and recommendations that endeavor should have been made to develop them without delay.

The arrangements for the convention were made by a committee of energetic workers and the programme was so planned that the delegates had one afternoon and one evening of the two days to devote to pleasure and recreation. Many availed themselves of the privilege of visiting the 1912 Boston electric show as guests of the Edison Electric Illuminating Company of Boston, giving special attention to the department devoted to electric vehicles, electric vehicle equipment and electrical accessories. The afternoon of the first day the visiting members were entertained by the Electric Vehicle Club of Boston, which had arranged for the use of electric cars for runs to several country clubs, with privileges of golf links, visits to the historic points and to the Revolutionary battlefields of Concord and Lexington. The members were the guests of the Edison Electric Illuminating Company of Boston at luncheon the second day, and in the evening the members and guests were entertained by the New England section of the Electric Vehicle Association of America at a theatre party.



Arthur Williams, New York City, President Electric Vehicle Association of America.

About 150 were assembled in the convention hall when the assemblage was called to order by President W. H. Blood, Jr., who after welcoming the members formally spoke in part as follows:

Two years of activity crowned with success proves conclusively that the formation of the Electric Vehicle Association of America was a wise move. Lukewarm manufacturers have been turned into enthusiastic boosters for the association; conservative central station managers now fully appreciate the value of co-operative effort in introducing electric vehicles, and scoffing members of the press, who thought there were already too many associations, are now scrambling to get aboard the electric band wagon.

Our present membership of 335 indicates a growth in the past year of 70 per cent., and these 335 members represent companies having a combined capital account of over $500,000,000.

A few years ago electric vehicles were not largely used and the public was unacquainted with their true worth. The vehicle manufacturers were not making large sales and their factory and selling costs were necessarily high. As few electric vehicles were being marketed, the battery manufacturers were making correspondingly few batteries. Central stations with comparatively high rates for electric current were hindering rather than helping the introduction of electric vehicles. All of these interests awoke at about the same time, joined hands and formed this association.

It is gratifying to note that this co-operative effort has brought about larger sales of electric vehicles with corresponding reduction in overhead charges at the manufacturing plants. Reductions in electric rates have almost invariably followed where central stations have made studies of this new load of charging electric vehicle batteries. The central stations have not failed to recognize the valuable feature of this off-peak business and their ability to take on this new load without adding to their capital accounts.

That the public is the ultimate gainer from the use of electric vehicles is now fully realized—the results of operation prove it. The progressive merchant, brewer, packer, express company and others are placing their orders not only for single wagons, but for dozens, scores, and, in fact, for entire fleets. The electric pleasure car or passenger car, as some prefer to call it, still grows in popularity, and with its graceful lines, low centre of gravity and elegant furnishings it will continue to be as it is now—the real car de luxe.

It is interesting to note that our friends, the gas car manufacturers, now advertise their self-starting cars to be "as simple as an electric," and some of them show with pride how far their cars will run on the electric starting motor with its storage battery. If we carry their advertisements one step further and substitute a larger battery in the space now occupied by the gasoline engine, we have the ideal vehicle.

It is proper to call your attention to a comparison between the price of gas and of electricity. Only a few years ago gasolin was a by-product which could hardly be disposed of. When the automobile industry started 10 cents a gallon was a ruling price. This price has constantly climbed to 14, 16, 18 and 20 cents, and even to as high as 25 cents in some localities. On the other hand the rates charged for electricity are constantly on the decline. The price of electricity used for charging the batteries in the first electric vehicles was at a rate of 20 cents a kilowatt-hour; a 15-cent rate soon followed, and for a number of years a rate of 10 cents or thereabouts was common. Today the user who charges his own single vehicle gets rates varying from nine or eight cents down to five or four cents a kilowatt-hour, while the larger user in certain localities pays between two and three cents. The entire tendency is downward. Is not this bit of history a convincing argument for the prospective truck purchaser, especially when it is remembered that the supply of gasoline is limited and is largely in the control of one corporation?

The owner of the electric vehicle has no fear of the dreaded hoof and mouth disease or of the new horse disease which has broken out with such violence in Kansas, where it has caused the death of 16,000 horses, or a property loss of over $3,000,000. It is estimated that in New York State there are about 600,000 horses. What if this disease should get a fast hold there? A

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loss of 10 per cent. of the total number of horses, which is entirely within the limit of possibility, would carry with it a monetary loss of at least $12,000,000, to say nothing of the suffering to the animals themselves and the inconvenience and the collateral losses to the owners.

Some day, and that not far in the future, I predict that all the dray horses in the large cities will be replaced by motor trucks. It would not be surprising if horses were legislated from the streets in the congested district within the next five years. A shrinkage at an increased rate is almost inevitable, for the congestion of traffic in our large cities is one of our serious municipal problems. By the use of motor trucks the saving of time, the reduction of the street space occupied and the increase in the size of loads handled, the problem becomes much simplified and partially solved.

Electric vehicles are most dependable. Operating statistics show that electric vehicles are in service more days in the year than any other transportation device. That the increase in the number of electric vehicles installed during the past year is at least partially attributable to the activity of this association is attested by many manufacturers.

The committees of the association have all done good work, and I hardly need recite what each one has accomplished, for in their reports, which will be read shortly, they will render an account of themselves. Recommendation is made, on account of the increasing duties of the secretary's office and the desire of some of our members that the scope of the office be broadened, that a permanent secretary be employed by the association on a salary to be paid by the association. This course I recommend, if it can be financed by the association as a whole and not by a few of its prominent members. During the past year the New England section of this association has been formed, an outgrowth of the old Electric Vehicle and Central Station Association, which furnished the idea and formed the nucleus of the Electric Vehicle Association of America. There was also formed late in the spring a Chicago branch of the Electric Vehicle Association of America. This branch is rapidly increasing its membership and adds strength to the parent association. It is hoped that similar branches may be formed in some of the other large cities. The co-operative idea of the association should be uppermost in our minds, for by working together we can best promote the use and adoption of the electric vehicle.

The report of the membership committee stated that Sept. 1 the association had a membership of 317, a gain of 120 as compared with the report of Oct. 10, 1911, the list including 83 active members, 222 associate members, seven auxiliary members and five press members, there being included among the members 17 electric vehicle manufacturers, 56 central stations and 10 accessory manufacturers. The geographical location showed 228 to be in the Atlantic Slope and Gulf States, including nine electric vehicle manufacturers and 32 central stations; 72 in the Middle States, including eight electric vehicle manufacturers and 13 central stations, and 17 west of the Mississippi river, including nine central stations. The association has two active branches, the New England section and at Chicago. The committee advised the engagement of a permanent secretary, and that one of the first of his duties be the establishment of branches of the association throughout the country, it being believed that the office could be in part, if not wholly, supported by an official organ.

The report of the emblem committee was to the effect that an association emblem had been selected and appeared on the stationary of the organization and a lapel button.

The report of the committee on insurance was submitted by Day Baker, chairman, and it was of extreme interest. An abstract of the report follows:

Report of the Committee on Insurance.

The committee on insurance, of the Electric Vehicle Association of America, by its efforts in collecting data as to experience with respect to accidents involving injuries to person and damage to the property of others in connection with the operation of electric trucks, also experience as to fire loss on same, has secured from the companies writing liability insurance a differential of 10 per cent. in the rates for the United States and Canada on all electric commercial vehicles. There has also been secured a reduction in the fire insurance rates on all electric vehicles, both commercial and pleasure, of 25 cents a hundred of insurance. By eliminating the theft and valued policy feature from the fire insurance the differential is increased to 50 cents.

With respect to fire insurance on electric vehicles these have for some time been receiving lower rates of premium. Prior to June, 1912, rates for the usual valued form of floater policy on automobiles have been as follows, for cars of the current year's model: Gasoline machines, 2.25 per cent. to 2.75 per cent.; electric machines, 2 per cent., and for older models: Gasoline machines, 2.25 per cent. to 4 per cent. (according to list price of car and amount of insurance); electric machines, 2 per cent.

For exclusion of the valued feature a discount of .25 per cent. had been allowed on gasoline machines, and for exclusion of both valued feature and theft hazard, a discount of .5 per cent. The minimum rate, however, in any event was fixed at 2 per cent. This minimum rate applied also to electric machines and therefore there was no discount for exclusion of the valued feature and theft hazard.

From the above you will see that prior to June, 1912, there was a differential in favor of electric machines of at least 25 cents, and this lower rate included theft hazard and valued feature. Some gasoline machines of current year's model could be written at a 2 per cent. rate by eliminating the valued feature. The differential on electrics as compared with gasoline cars on older models was much greater, ranging from 25 cents to as high as $2. In June, 1912, the rate on electric machines was reduced to $1.75 for policies including the theft hazard and value feature, and a further reduction of 25 cents allowed for elimination of these two features. The fire insurance rate for electric automobiles is therefore now for all models $1.75, and for non-valued, excluding theft form, $1.50.

With respect to rates for liability insurance there has for several years been a differential rate for electric pleasure cars. Outside of certain differential territory, such as New York City, Boston, Chicago, etc., which take a higher rate on all classes of automobiles, liability insurance rates for electrics have been: $20 a year for liability covering personal injuries or death, and $7.50 a year for liability for damage to the property of others. The rates for the lowest rated gasoline cars have been $25 for the liability, and $10 for the property damage, and the rates on gasoline cars increased in proportion to the horse power.

In the differential territory, such as New York City, Boston, Chicago, etc., the rate for electric pleasure vehicles has also been proportionately lower than for the gasoline cars. Prior to June, 1912, there had not been a differential rate for liability insurance on electric commercial vehicles. In June, 1912, a 10 per cent. differential rate was made for electric commercial vehicles, this differential applying to the entire country.

While it is true that in June, 1912, the companies made a reclassification of commercial cars, which in some instances increased the rate on certain classes, still the re-classification resulted in a lower rate on more classes of cars than it did in an increased rate. As a matter of fact there was a prior reclassification of commercial cars in July, 1911. At that time while there was a change in the classification of some types of commercial cars which increased the rates, there was a reduction in rate of from $10 to $25 on most classes, but no differential was then made for electrics.

On class of cars upon which the rate was increased in July, 1911, was "construction and repair cars of electric light and power companies, telephone and telegraph and street railway companies." This classification, however, does not refer to the ordinary commercial trucks used in the business of these companies, but simply to the "hurry-up" wagons and line repairing wagons used in construction and repair work. This class of wagons was at that time placed in the highest rated class.

At the same time trucks used by brewers, parcel delivery concerns and general truckmen were taken from the highest classification and reduced to a lower classification. In the reclassification of June, 1912, the only classes of commercial vehicles upon which the rates were increased by the change in classification were as follows: Barrel and box makers and dealers, boiler dealers and makers, building material merchants, carpenters, cleaners and dyers, coal dealers, contractors, feed and grain dealers, fire patrol and salvage corps automobiles, furniture moving, gas and water mains, ice cream dealers, junk and scrap iron dealers, laundries, lumber dealers and manufacturers, machinery dealers, masons' materials, oil distributing companies, piano movers and dealers, police patrol automobiles, railway iron, structural iron and steel.

Upon the following classes the rates remain the same: Ambulances, baggage transfer, bottlers, brewers, department stores, dry goods stores (retail), electric light companies (construction and repair cars), telephone and telegraph (construction and repair cars), street railway companies (construction and repair cars), express companies, liquor dealers, mail wagons, news companies, newspaper delivery, parcel delivery, safe movers and manufacturers, truckmen.

On all other classes of commercial trucks there was a reduction in rate on gasoline cars, and it will be noted that cars used by nearly all wholesale and retail stores and manufacturing plants would receive this reduction in rate. In addition there is a further 10 per cent. differential on all electric commercial cars. This reclassification and the differential rate on electrics apply to the entire country.

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The report of the committee on the establishment of a course in instruction in electric vehicle practise stated that the proposition had been made to and had been accepted by the principal of the West Technical high school of Cleveland, O., a recently completed institution, and during the past summer one of the instructors has been actively employed at one of the large electric automobile factories in Cleveland to prepare himself for conducting the course, learning the construction of electric machines and making a special study of repairing and adjusting. He has made a decided progress in preparation and while he is competent to undertake the work he is to continue to perfect his knowledge by continued research in electric automobile and battery factories and stations. The automobile factory is fostering the proposition with a belief that the students will be available for factory as well as garage service, and that some of them will be competent to serve as salesmen. The course was outlined, and it was stated that it was believed well to undertake the work in Cleveland from the fact that it contained several automobile factories and was well located geographically for the distribution of young men who become trained in electric automobile work.



Frank W. Smith, New York City, Vice President.

The report of the committee on standardization made a statement that it had secured the adoption of a standard charging plug, the dimensions being carefully determined with a view toward meeting every requirement. This plug has already been adopted by nine different concerns, and two others have approved it, and it is the belief that it will be accepted and adopted generally. The committee further reported on the standardization of lamps with the recommendation that the Ediswan bayonet socket be adopted, with the candlepower, voltage and type to be later reported on; on the energy consumption for cars with the recommendation that the maximum tractive effort or draw bar pull be standardized for a given size of tire, so that all vehicles would be on an equal basis with the given tire.

The committee on papers made report that the average attendance at the monthly meetings of the association was 150, and made recommendation that the policy of taking up a single subject at a meeting be continued, that the assignment of authors and subjects be made six months or more in advance, that all possible publicity of the meetings be obtained, and that the papers be printed and distributed to members and others sufficiently in advance of the meetings to awaken interest and develop discussion. The report stated that there was a prospect with the greater activity of the industry and the possibilities for obtaining data and information the association ought to be able to do a very valuable work in promoting the use of the electric vehicle for business and pleasure purposes. The committee suggested close co-operation and the standing committees of the association that material might be provided by these committees for the presentation of papers and reports, especially with reference to data on operating costs.

The committee on rates and charging stations in its report emphasized the need of the energy and influence of the central station in promotive work, and stated that with the increase of numbers the question of properly caring for and maintaining the electric vehicle became more and more important. While owners of large fleets of wagons could afford and obtain all the expert service desired without influence on the economy of operation, it was believed that the man owning one or several vehicles was much impressed with the need of access to large and well equipped garages where machines, and especially batteries, could be cared for by experts at reasonable cost. It was felt that in some sections of the country at least the private garage and charging outfit were becoming less popular and the convenience and economy of the well conducted public service station more keenly realized. From the viewpoint of the central station though the private garage and charging equipment is used in smaller volume and at higher rates a kilowatt-hour than in the public garage, yet when the load factor and quantity is considered the latter class is more desirable and the price is better than with the former, while with the public garage the service from the machines is more constant and better satisfying.

The committee believed that the maximum price charged for energy should be lower rather than higher. It also made recommendation that the monthly total charge for service by garages should have the item for current separated from other charges, the reason being that with the wide difference in the use of vehicles to assume a single monthly price for service results in a low price for some and a high price for others, considering the variance in current consumed. The committee made report and recommendation of a uniform sign for charging stations, it being believed that the increasing use of electric machines would impel the establishment of these on the principal highways as well as in the towns and cities, and urged upon the central stations of the country the necessity of encouraging the use of electric vehicles, maintaining that the vehicle manufacturers ought not to bear the entire burden of development, while co-operation would no doubt be productive of extremely profitable and much quicker results. The recommendation as to the charging station sign was left to the executive committee.

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The appointment of a nominating committee and tellers for the election was followed by the presentation of the paper "Where We Stand Today," by C. E. Michel of St. Louis, Mo. He said in part:

Where We Stand Today.

The day for apology has passed. The electric of today is a machinery unit designed and perfected to do a definite work. Why say that it is a compromise? It is no more a compromise than is a gasoline truck, a freight hauling steam engine, or a trans-Atlantic freighter. Its field of correct application is just as clearly defined as is the field of each of these; and in this field it is as efficient and of equal economic importance.

Go back to the records as late as 1908 and you will see that the question of mileage was one that disturbed the believer and the unbeliever alike. At that time, according to the version of the electric vehicle pessimist, the storage battery had reached its maximum of efficiency and capacity and, consequently, the electric was more of a joke than anything else; it was never to be recognized as a legitimate means of locomotion, and the very limited field would be quickly worked out. Eventual failure was to be the portion of those who staked their future on it.

There no longer exists a question of mileage. Pick up the catalogues of the modern electric. With few exceptions you will be unable to find a word on the subject and yet the good substantial electric of 1912 will go but little farther on one charge than would its prototype of 1908; but we now know where the electric belongs and the public knows that it will perform best the work for which it is designed and sold. There have been no meteoric careers in the electric field, and the sensationalist has been conspicuous by his absence. The growth has been substantial, surefooted and of healthy proportions. The central station has come to the realization of the value of the load, its beneficial influence on the load factor with all that this means; the public, the necessity for the car; and the manufacturer has developed and improved his product to fit a condition exactly as has the steam engineer and the ship builder.

Consider the financial condition of the electric vehicle manufacturers. All of the old ones are with us still, and new ones are making their appearance with regularity. They are nearly all prospering. To impress this fact I make the statement that taken as a whole the electric vehicle manufacturers today are financially in better shape than are their brothers in the gas car industry. The electric pleasure car, through intrinsic worth and public need, is entrenched so strongly in its legitimate field that to speak of it with apology is ridiculous.

With our lessons behind us, we should approach the electric truck, not with doubt but with the certain knowledge that it is hopeless to try to keep it out of its own. The handwriting is on the wall and the electrification of our city merchandise delivery systems is under way. It is not as though we were trying to introduce an article of questionable merit, for the electric has been proved up. We are not trying to create a field for it. On the other hand, the electric has been developed and perfected to fit a certain need. I think it is generally accepted that as a result of inherited habit we are accepting limitations and objectionable features in horse transportation that would be absolutely fatal to the introduction of any unfamiliar transportation.

The intelligent, level headed business man of today will put on this money and time saving machinery just as soon as he recognizes its merit. He will not, however, take it on faith, and it is our task to bring him the light. The field is there, no well informed person will question that. It is an enormous one. A recognized authority some years ago made estimates that lead to the conclusion that the trackless haulage of this country is 16 times that of the track hauling. The vast majority of this trackless haulage is done in the cities, and of this at least 80 per cent. can be handled by electrics cheaper and better than by any other method. The central station is needed to bring about the quick and correct development of the business. The money they have invested and the work they have done in its interest in the past four years is conclusive evidence that they are convinced of the merits of the case, and, further, that the manufacturer may count on them as a working ally.

On the manufacturer rests the real burden of educating the business world as to what the electric can do for it, and when a central station puts in operation a fleet of electrics, the manufacturer is certainly morally obligated to actively prosecute the development of the business in that territory and not to promptly forget that locality and leave the selling of more cars and the future of those already sold up to the central station. The real thinkers among the men of this country who have the delivery problem to solve, have made their decision. They know that all electrics are good even though some are better than others. You are familiar with what the express companies, the breweries, the large department stores and the packing houses are doing. These are money making concerns and they buy nothing on guess work or sentiment.

After brief discussion R. McAllister Lloyd of New York City read a paper on "Streets and Traffic Conditions as Related to the Electric Vehicle," who said:

Streets and Traffic Conditions.

In the early days of the automobile industry it was frequently stated that economical transportation with self-propelled vehicles could not be accomplished until good smooth streets and roads were provided, and particularly that storage battery vehicles would require much better streets than were then available in American cities, but fortunately there has been enough pioneering spirit to push ahead the automobile development without waiting for perfect streets and the result has been to obtain vehicles for work and pleasure that may be successfully operated under unfavorable street and road conditions.

The pleasure vehicle equipped with pneumatic tires first arrived at a stage of dependability which justified its general adoption. The good roads movement which in the beginning had been conspicuously advocated by automobile promoters then received great impetus from the desire of many automobile users to travel faster and farther.

The commercial automobile has now been so largely adopted that it should be possible to secure co-operation among users in the matter of agitating the necessity for better city streets. While it is true that engineers and manufacturers have developed wagons and trucks, both electric and gasoline, which are capable of withstanding the rough treatment experienced in operation in most American cities, the cost of upkeep would be largely reduced if Belgian blocks could be eliminated, holes in asphalt filled up, proper rails used for trolley tracks and rails maintained flush with the street surface.

While it is true that the conditions and difficulties to be met are different in every city it might be possible for this association to take up the subject of good streets with kindred associations and endeavor to concentrate engineering effort and public spirit on a movement for a higher standard in the construction and maintenance of city streets with a view to lowering the cost of transportation and consequently the cost of living, for the less it costs to transport the necessaries of life through the streets the less the consumer will eventually pay for them.

I shall not attempt to propose solutions for all the vexing problems that confront the street commissioners and departments of water, gas and electricity, but I believe a great deal can be done by securing co-operation of all those interested in providing a surface on our streets which will be suitable for motor vehicle purposes and not subject to frequent disturbance.

So far as this relates to the electric vehicle it can be stated as a fact that the electric vehicle being used at slower speeds than that driven by gasoline suffers less from contact with bumps, but it is far more important to have good streets for any kind of automobile than for horse drawn wagons, and the advantage in changing from horses to other motive power will be greatly increased if at the same time better streets and more thorough maintenance can be secured.

I believe the time has arrived when efforts should be made to rouse the public to a realization of the great advantages to be gained and committees appointed by all the automobile organizations to co-operate in the study of present conditions, future requirements and possible solutions.

Much improvement is apparent in all large cities in the matter of regulation of traffic and the public has taken kindly to the methods employed for systematically controlling its streams, but a study of accident statistics indicates that our streets are full of danger and that methods must be taken to stop the increasing loss of life due to the invasion by automobiles. As we cannot banish people from the streets we must study methods of protecting them from injury.

The motor truck is not the only offender, and at the present time passenger vehicles are largely to blame for accidents reported, but as commercial vehicles drawn by horses have always been greater in number than passenger vehicles, and as they are all destined to become motorized, accidents are likely to increase unless radical measures are taken to limit the speed of motor traffic. The subject is worthy of serious study, and it may be found advisable to give consideration at the same time to the character, weight and controllability of vehicles permitted in city streets.

Up to the present time the electric vehicle for both passenger and commercial use has maintained a reputation for sane speed and ease of manipulation, but there seems to be a growing tendency for salesmen to advocate higher speeds, and if no protest is raised we shall find within the next few years the entire traffic of our streets speeded up to the pace set by taxicabs.

From an engineering standpoint it is perfectly practicable to increase the average speed of electric wagons and trucks about 50 per cent., but I question the advisability of so doing. Is it not wiser to stick to the speeds now prevailing in the operation of electric trucks and advocate them for all methods of propulsion, not because electricity is inherently slower than gasoline, but because the interests of humanity are conserved by so doing?

At the evening session Frank W. Smith of New York City, chairman of the sub-committee on publicity and advertising, made report of the work accomplished by the association through the committee, this detailing the promotive policy established, the names of the

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subscribers to the national co-operative advertising fund, the amounts expended for advertising with each publication used, together with abstracts from letters relative to the service by some of the subscribers, as well as statements from the report of the committee on electric vehicles presented at the national convention of the National Electric Light Association held at Seattle in which general promotion by advertising was advocated. Results, both direct and indirect, were discussed, and the committee recommended that the campaign be continued for another year, that immediate steps be taken to obtain subscriptions for the second year's campaign, that the committee be enlarged, that a publicity department be established and that a system be adopted for following up the inquiries and developing the business that may be created. This report was discussed at length and there was a very comprehensive statement made relative to the productiveness of co-operative advertising by W. D. McJunkin, this being now engaged in by large interests.



Harvey Robinson, New York City, Secretary.

The paper on "Notes on the Cost of Motor Trucking" by Prof. Harold Pender and H. F. Thomson of the electrical engineering department of the Massachusetts Institute of Technology, who are engaged in vehicle transportation research work, was read by Prof. Pender. It was extremely comprehensive and was accompanied by carefully detailed tabulations for comparison. This paper was discussed briefly. The second session was concluded by a paper on "Some Recent Developments in the Lead Battery for Electric Vehicles" by Bruce Ford of the Electric Storage Battery Company of Philadelphia.

At the opening of the second day's session the result of the election of officers was announced as follows: President, Arthur Williams of the New York Edison Company, New York City; vice president, Frank W. Smith of the United Light & Power Company, New York City; secretary, Harvey Robinson of the New York Edison Company, New York City; treasurer, Day Baker, district manager for the General Vehicle Company, Boston, Mass.; directors, for three years, W. H. Blood, Jr., of Stone & Webster, Boston, Mass.; P. D. Wagoner of the General Vehicle Company, Long Island City, N. Y.; George H. Kelley, New York City; E. S. Mansfield of the Edison Electric Illuminating Company of Boston, Mass.; for one year, to fill an unexpired term, William G. Bee of the Edison Storage Battery Company, Orange, N. J.

The report of the committee on operating records was presented, which was in part as follows:

Report of Committee on Operating Records.

While your committee has not given this important subject the careful attention which it warrants, the individual members of the committee have given the matter a great deal of thought and have carefully gone over the different systems of accounting and operating records of the various lighting companies and such large private garages as were available. The result of this careful comparison has brought out the fact that while many of the systems in use are good, and every system which is being faithfully carried out is giving satisfaction to the parties using it, for comparative purposes and for the comparison of the availability and economic possibilities of the electric vehicle with other methods of transportation (for use in an advertising campaign) proper records are not available, nearly all of them being made up from entirely different points of view. It would be absolutely impossible to get the average cost of the various items entering into the cost of operating vehicles except by an individual analysis of conditions on the ground. It would, therefore, seem to your committee that this important subject should receive further and more careful consideration.

There are at the present time three associations vitally interested in the success of the electric vehicle—the Electric Vehicle Association of America, the National Electric Light Association and the Association of Edison Electric Illuminating Companies. Each of these associations has appointed, from time to time, committees covering this subject, and while much valuable work has been done by the various committees nothing really tangible has been worked out. We are of the opinion that arrangements should be made for the working out of a complete system of accounting and operating records, which system should be compiled by a competent public accountant who, prior to making his report, should make a tour of the principal cities in the country where electric vehicles are being largely used, and obtain from the principal users the facts as to their requirements and what should be known, so that when a complete system is evolved it will be satisfactory for both the small and large garage, the central station, and the department store. In working up this system consideration should also be given to a suitable system of accounting for gasoline propelled vehicles. In the transportation of merchandise two items are given consideration—cost and time. If the time taken to transport material is satisfactory, the principal item then is cost, and if we can have a true statement of the cost we have nothing to fear from gasoline competition.

Until such time as a complete, satisfactory, co-operative report can be made your committee would recommend that the operating expense of electric vehicles be carried under three headings, i. e., operating charges, fixed charges and overhead charges. Operating charges should be sub-divided into the following headings: Lubricants, electricity, battery renewals, tire renewals, repairs material, repairs labor, painting. Fixed charges should be sub-divided into these headings: Garage general expense, garage labor, sundries, driver, helper. Overhead charges should be sub-divided as follows: Amortization, interest, fire insurance, liability insurance, administration. In the above arrangement the so-called operating charges are in general proportional to the mileage of the car and are directly comparable to similar expenses for gasoline vehicles. The fixed charges are independent of the distance travelled. The so-called overhead charges frequently do not exist as actual expenses, although insurance is generally charged directly against the vehicle.

In addition to the record of costs, there should also be kept a system of operating records of the individual cars covering the following:

First—The history of every battery, including the date of purchase, use, life of plates, times washed or repaired, and miles operated.

Second—A tire record in which the history of each tire is kept, showing the miles operated and type of vehicle upon which tires were used.

Third—Wherever possible a performance record of the vehicle should be kept showing the data upon the work performed by the car, including such items as calls, pieces and weights delivered, wherever the work is such that these units may be used.

In closing, your committee would particularly urge the executive committee of the association to endeavor to have, if possible, a co-operative report made by the three associations most directly interested in pushing the electric vehicle business. If this cannot be done, then we would suggest that the executive committee take up the matter with our membership to see if it cannot be accomplished through voluntary subscriptions.

The discussion of this report was followed by a number of papers. The members and those attending the convention were the guests at luncheon of the Edison Electric Illuminating Company of Boston

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and in the afternoon the session was given over to papers on "The Standardization of the Electric Vehicle" by Alexander Churchward of New York City; on "The Edison Storage Battery in service" by Harold H. Smith of Orange, N. J., and on "The Electric Vehicle from an Insurance Standpoint" by Carl H. Clark, the last being in part as follows:

The Electric Vehicle from an Insurance Standpoint.

The interest of insurance underwriters in the electric vehicle is naturally centred upon those points which affect its desirability as an insurance risk, without regard to the mechanical features, except so far as they affect this question. This in turn involves the questions of the possibility of damage which may cause loss under the policy, and also of the facility and cost of repairs.

While the number of losses on electric vehicles is so far, not sufficiently great as to occasion any undue concern, losses are nevertheless occurring with some degree of regularity and from a fairly well defined series of causes. It is thought that a somewhat systematic presentation of the matter, with the several causes as far as definitely ascertained, may be of interest and may result in bringing out further suggestions for the improvement of the present conditions.

As to the relative rates of insurance on electric and gasoline cars, it may be stated in a general way, that the rate on the former is at present about one-half the average rate on the latter. The rate on the electric cars remains at a fixed percentage, while that on gasoline cars is based on a sliding scale, increasing with the age of the car. The rate on electric vehicles has recently been reduced, and since the rates are based on experience it may be presumed that should the conditions improve a further reduction might be made, while if the number and amount of the losses should increase, an advance would probably take place. It would seem to be to the advantage of builders to so construct their vehicles as to lessen as far as possible the risk of fire.

As to the various causes of loss, data have been obtained from the experience of insurance underwriters, and also from one of the large users of electric vehicles of several types. The causes as observed seem to fall more or less definitely into the following classes, the order representing in a general way the relative frequency: (a) Overheating of resistance coils by accidental throwing on of the current while the car is at rest; (b) heat given off by resistance coils in ordinary use; (c) short circuit in wiring caused by water or snow; (d) short circuit in wiring caused by the chafing or bruising of the insulation; (e) ignition while charging.

The above may be called direct causes, and in addition the following indirect or consequential causes may be cited: (f) Damage to batteries claimed from rapid discharge by a short circuit after a fire which has burned the insulation, and (g) damage to the batteries from the jar of a collision, where the car itself suffers comparatively small damage.

In this classification, what might be called external causes, such as garage fires, spontaneous combustion, fire in adjacent cars, have been excluded; in other words, only such causes as seem to be peculiar to the electric vehicle have been considered. Considering now the causes separately in detail:

(a) Those resulting from accidental throwing on of the current—Fires from this cause seem to have been the most frequent. They result usually from the accidental movement of the control lever after the car has been brought to a stop without drawing the plug, and with the brakes set. Very commonly the control lever is thrown from neutral into first speed by catching in the coat sleeve or skirts as the operator leaves the car. The resulting heat in the resistance has been the cause of many fires. Occasions have been noted where the car has travelled a few feet under the above circumstances, and brought up against a wall or snow bank with the same result.

As a remedy for this it is suggested that it might be possible to fit the control lever with a pawl or latch, similar to that fitted on some selective type of transmissions to prevent accidental throwing into reverse. This could be arranged to be operative only in passing out of neutral, and so that the act of grasping the lever would release the latch. It might be also desirable to so arrange the connections that the setting of the brake would automatically break the circuit. It would also seem to be desirable that some method be devised whereby the drawing out of the plug might be made more positive and less liable to be neglected, both as a preventative of fire from the above cause and also as acting to prevent, in a measure, the theft of the car.

(b) Heat given off by resistance coils—While under the usual running conditions the heat given off by the coils is readily dissipated, there seem to be some conditions, such perhaps as a heavy flow of current at low speed, where the heat given off is of an unusual amount. This heat is often of sufficient intensity to ignite the woodwork in the vicinity.

The evident remedy for this is to allow more air space around the resistance, insulate the woodwork as thoroughly as possible, and to provide for an effective circulation of air. This particular point seems not to have received the consideration which it merits, as although apparently a simple matter, many losses have resulted from it.

(c) Short circuit in the wiring by water or snow—It has been noted that the accumulation of snow or slush thrown up by the wheels on to the under side of the car, and the building up around connections or possible bare spots, has allowed a short circuit with the consequent arc, starting a fire in the neighboring woodwork.

The writer has noted recently the running of the feed wires in metal conduits. The extended use of conduits and junction boxes throughout would eliminate this cause. It would be necessary to so arrange the wires that no rubbing could take place, to wear the insulation, and wherever wires leave the conduit, a rubber or fibre thimble should be fitted to prevent any possibility of chafing on the edge of the conduit. The fitting of these conduits or some similar method would be a small expense, and one that would seem to lead to many advantages.

(d) Short circuit caused by defective insulation—This class is similar to the preceding, but differs from it in that it is produced by a defect rather than by an external condition. The insulation may be chafed by rubbing on some sharp edge or projecting portion, permitting the current to arc across. Extra care in wiring the car would be a step in the direction of prevention, which the more extensive use of fibre tube or similar substance would also aid. The metal conduits recommended under the previous heading would, if properly fitted, greatly reduce the liability from this cause. Loose swinging wires should be avoided as far as possible and all wires should be run so as to avoid vibration and the consequent rubbing.

(e) Ignition while charging—but apparently from none of the above named causes—While fires of this nature are not of very frequent occurrence, they are more difficult of analysis, as the car is likely to be without attendant and in an isolated place. It has been suggested that possibly the gas given off by the batteries has in some way become ignited, as by an open gas jet or similar cause. Fires under these circumstances have usually been severe, which might seem to show that the gas had flooded the car and the fire become general when once ignited. With this in mind it might be suggested that charging be done in a well ventilated place, and without open artificial light.



Day Baker, Boston, Treasurer.

(f) When from some of the above causes a short circuit has occurred and the batteries have discharged quickly, damage has been claimed for deterioration of the batteries and consequent loss of mileage. While losses of just this nature are not common, they have when occurring been of rather large amount, requiring the overhauling of the batteries. It is suggested that possibly a fuse plug might be fitted in some position near the battery, but accessible, which would fuse and thus prevent the discharge.

(g) In certain cases of collision, where the damage to the car itself has been slight, the batteries have suffered severely from the shock. Were the damage general it would not of course cause remark, but in the cases cited the damage was mostly to the batteries. This is not a particularly important phase of the matter, but it might be that a slightly flexible mounting for the batteries would be of advantage.

In conclusion it may be stated that from an insurance standpoint the desirable features would be: Some means of practically compelling the withdrawal of the plug when leaving the car; positive lock on control lever at neutral position; resistance well ventilated and at proper distance from woodwork; wires run in conduit or similar precaution; all loose or swinging wires eliminated; charging done without open lights.

It is a fact greatly to be deplored that automobile manufacturers, both of gasoline and electric cars, do not more commonly make a practise of stamping the serial number upon some heavy iron or steel part where it cannot be defaced. The usual brass plate attached to the woodwork is very likely to be removed while the car is being painted, or from some other cause, and not replaced. In the case of a severe fire the brass plate will melt completely, even though attached to the steel frame. In cases like this absolute identification is impossible, and much trouble has been caused, both to owners and adjusters, by this lack. The custom of the makers of one car, of stamping the number into the steel frame in definite location, has several times proven to be of great advantage and this is a point which may be urged as of more than passing importance.

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ELECTRIC VEHICLE PRACTISE.

Development from the Primary Battery Tricycle of Andrew L. Riker in America in 1884 to the Pleasure Vehicles and the Riker Wagons of 1898-9—Sultan of Turkey Was Owner of First Practical Carriage in 1886.

By William W. Scott.

THE self-propelled vehicle was an ideal that attracted many ingenious men, and many endeavors were made to create what would be practical, economical and reasonably adaptable for general purposes, but until Daimler in 1885 constructed an operative gasoline engine tricycle comparatively little success was attained. Daimler's invention caused a number of European inventors to direct their attention toward the building of highway vehicles of similar type, but the possibilities of electrical energy were not seriously considered by them until 1887, when the Sultan of Turkey gave an order to Immisch & Co. of London to build for him a carriage that would not be drawn by horses, nor propelled by steam, that would be noiseless in operation.

Had the commission been placed by an individual who regarded money for its actual value, and whose expenditures were definitely limited, it is not probable that it would have been taken seriously, but as the main purpose was to execute an order by royalty without consideration of expense, the company did not hesitate to undertake it. After deliberating the available sources of power, compressed air was first decided upon, but this not giving promise of satisfaction the company turned to electricity and built a carriage that was defined as a dog cart. The cost of the machine is not definitely known, but it was undoubtedly a large sum. The experimental work was costly and without previous experience the vehicle could not be otherwise than crude.



First Practical Electric Vehicle, a Dog Cart Built for the Sultan of Turkey by Immisch & Co., London, England, in 1886.

This vehicle is illustrated and observation will disclose that it was typical of the dog cart in general appearance. Details of its construction are not available and but little is known of its capacity in speed or mileage, but it was serviceable and it was sufficiently novel to be accepted by the monarch of Turkey. Referring to the illustration it will be seen that it was driven by a motor suspended beneath the body, the armature shaft forming a jackshaft carrying pinions at the outboard ends. Notched segments were bolted to the felloes of the rear wheels to serve as sprockets and the drive was by double side chains, there being a single reduction from the jackshaft to the traction wheels. The brake was a pair of shoes applied in the ordinary form of animal vehicle construction to the steel tires of the rear or driving wheels. The battery, it is understood, was carried beneath the seats.

The body was mounted forward as was an animal cart, with a turntable or fifth wheel, and on this was bolted a toothed segment that meshed with a pinion on the lower end of the steering column. This column was supported by a standard fitted to the floor of the body, and at the upper end of the post was a crank with a handle by which the carriage was steered. The manner of control and similar interesting data have been lost sight of.

The carriage was sent to Turkey and was used by the Sultan, but with what success is problematical. At that time there was but little general knowledge of electrical charging or the general requirements of vehicle maintenance, so it is probable that the dog cart for a time literally, if in no other way, amused its owner.

What is believed to be the first electric vehicle ever built in the world was constructed in 1884 by Andrew L. Riker, a Columbia college engineering student, who adapted a tricycle with a motor and driving system, and installed a primary battery as a source of current. This use of a primary battery with small productiveness of current was the reason the vehicle could not be regarded as a success, for it could be driven on a level floor at a speed of about three miles an hour. The machine was used for experimental purposes and it at-

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tracted a considerable degree of attention. It was the forerunner of the electric vehicle in America, as its inventor later on became one of the pioneers of the industry and was the head of the first concern organized in this country to build conveyances of this type.



Fred M. Kimball, Builder of the First American Vehicle Driven by a Storage Battery.

The second electric vehicle constructed in America so far as is known was the adaptation of a manually driven tricycle of English make. In the summer of 1888 P. W. Pratt of Boston of the Elastic Tip Company, a concern manufacturing rubber goods and novelties, consulted Frederick M. Kimball, of Kimball & Co., electrical engineer and contractor, the firm at that time having a factory in Portland street. Mr. Pratt wanted a machine that could be driven safely and comfortably about the streets of Boston, that could be easily operated and would replace the horses then generally used. He purposed to use electricity and a storage battery, batteries at that time having attracted considerable public attention. He wanted the vehicle and sought Mr. Kimball to learn whether or not such a construction as he proposed was practical.

Mr. Kimball undertook to equip the machine and so the tricycle was purchased. The motor was designed of a bi-polar type with a capacity of about one-third horsepower. The motor was installed on a platform and there was a triple reduction through one set of gears and two chains. The battery consisted of six Julien cells and was contained in a wooden crate suspended from the main frame by spiral springs to prevent the jars of road shock damaging the battery. The weight of the machine without a passenger was about 300 pounds. In the illustration the vehicle is shown with the battery removed.

When completed the tricycle was first shown at Winthrop square, and later it was demonstrated on the asphalt paving of Columbus avenue. Next it was shown on the drives in Central Park, New York City, and after that it was driven on the boardwalk at Atlantic City. On a level, smooth highway it had a speed of from six to eight miles an hour. Mr. Pratt did not find that it was practical for his own service, however, and while a novelty it was not possible to use it in the work it was hoped it would be useful for. Wherever shown the tricycle attracted much attention and favorable comment.

The third machine built was constructed by Mr. Riker in 1891, this being a tricycle that was equipped with a motor of about one-eighth horsepower and in which a storage battery was the source of current. This was a much more successful vehicle than the first because of the different form of battery, and it was used for experimental work from which was later developed the pleasure cars and the service machines produced by the Riker Electric Vehicle Company at Newark.

The first practical electric road vehicle of America was built in 1891, contemporary with Mr. Riker's experimental work, by the Holtzer-Cabot Electric Company, Boston, to the order of Fiske Warren of Boston, and it may be said that this was a very well thought out and developed construction. In this, a runabout, there was originality in that the motor was suspended transversely in the chassis frame, the drive being direct from the sprockets on the outboard ends of the long armature shaft to the sprockets on the rear wheels through chains, the differential being incorporated in the armature shaft. The following description of the vehicle was published:

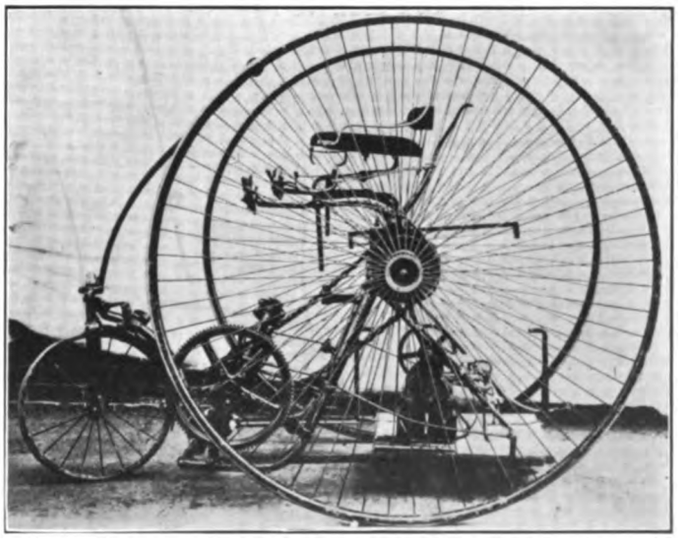
The carriage here illustrated was built for Fiske Warren, Esq., in 1891. Its seating capacity is subordinated to the room required for the storage batteries in order to permit as long a run as possible on one charge.

It is steered by a hand wheel connected with the front wheels by a reducing gear, thus allowing better control when running over rough roads and is arranged in such a way that it can be locked in any position by a foot latch, thus keeping the carriage running in a straight line, leaving the operator's hands free.

For varying the speed a series parallel controller is placed under the carriage body. It is operated by a lever located conveniently to the operator. There is also a reversing switch, allowing the motor to run in either direction.

A battery consisting of 40 "11-E" chloride accumulator cells is coupled to control in four groups of 10 cells each; this construction gives speeds of four, eight and 16 miles an hour when running over good, level roads; quite heavy grades may be climbed at slower speeds without overtaxing the motor in the slightest degree. Under the middle speed the carriage will run about 40 miles on a single charge.

On the dasher is a single pole switch that is used to cut



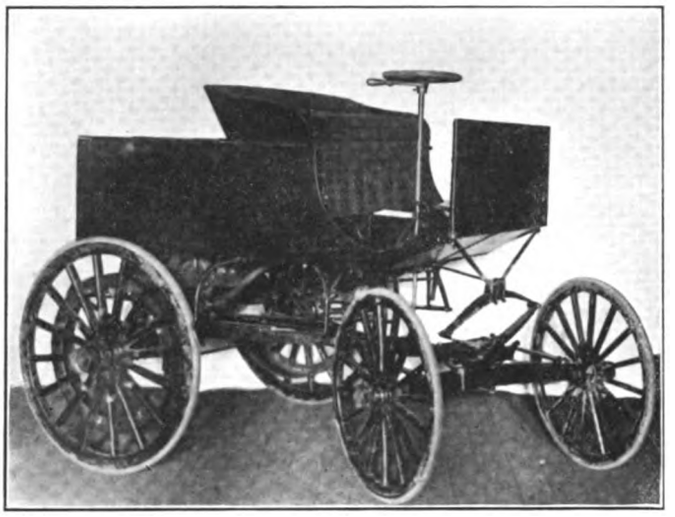
First Practical Electric Tricycle Built in America, Constructed for P. W. Pratt of Boston by Fred M. Kimball of That City in 1888.

out the motor when charging the batteries and also prevents the carriage from being started when left unattended.

The batteries may be charged directly from a 110-volt system, charging terminals for this purpose being placed directly in front of the controller within easy reach. The motor is se-

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ries wound, especially designed for this carriage with a maximum speed of 600 rpm, and has a capacity of four to five horsepower. The differential gears allowing the rear wheels to turn at a different speed when turning corners are directly connected to the armature shaft. The armature is geared directly to the rear wheel by a special sprocket chain and runs over cut gears which are attached to the rear wheels. The sprocket chain applied in this way makes very little noise even when the carriage is running at its highest speed. By this method we have done away with the intermediate gears commonly used, thus avoiding not only a great deal of noise, but also a great deal of friction.



Second Two-Passenger Electric Vehicle of America, Built by W. H. Blood, Jr., at Kansas City, Mo., in 1892-3.

While the weight of the carriage with motor and batteries is nearly 3000 pounds, yet the carriage can be worked with great ease and is in every way a satisfactorily running carriage.

So far as is known no illustration of this vehicle exists. It will be realized that it had surprising capacity considering the batteries, and aside from absence of current measuring instruments was as complete as are the machines of the latest type.

The second practical form of road vehicle was that designed and built in 1893 by W. H. Blood, Jr., then of the Franklin Electric Company, Kansas City, Mo., who for the first two years of its existence was president of the Electric Vehicle Association of America, and is now connected with the Stone & Webster Corporation. Mr. Blood was then an active electrical engineer and he was commissioned by a Kansas City physician to build for him an electric runabout or buggy. The machine in general appearance was not unlike a horse vehicle, and its main difference was in the small front wheels and the angle of the floor forward.

The motor was specially built and while rated at three horsepower would develop double its rating. The motor was suspended from the rear of the body and the armature shaft was mounted in two plain bearings carried in two brackets. The shaft was long and at either end was a rawhide pulley. These pulleys contacted with two steel drums bolted to the rear wheel spokes in much the same way that brake drums are now attached. The weight of the motor was considerable and when adjusted it was with the rawhide pulleys against the wheel drums, so that when the motor was revolved the machine was driven by friction. The difference in the sizes of the pulleys and the drums gave sufficient reduction. Each main bearing bracket was fitted with a bolt that extended upward to the bearing, and on each bolt was a nut. Attached to the nuts were levers extending forward, and linked to these were bell crank levers coupled to toe pedal shafts. There was no differential and to compensate for the difference in wheel speed in making turns the toe pedal at the inner side was pressed and the nut was turned on the bolt, lifting the rawhide pulley from the wheel drum so that the wheel turned free on the axle. When the pedal was released the armature shaft bearing was dropped to its normal position and driving contact was restored. The clearance between the pulleys and the wheel drums was comparatively small and the drive was found to be remarkably effective. Mr. Blood says that it was the only vehicle he has ever seen that was absolutely noiseless in its operation.

The battery was built by the Electric Storage Battery Company and was of 30 cells, being carried in a crate beneath the seat. The vehicle was steered by a vertical post on the top of which was a hand wheel, and beneath the wheel was the control lever. The body was mounted forward on a turntable or fifth wheel, and a toothed segment was bolted to the turntable and a pinion at the base of the steering column meshed with the segment. The wheels were equipped with solid tires, these being of the type then being adopted for carriages and used on bicycles. The speed of the vehicle was about 12 miles an hour and it was found to be an excellent hill climber, ascending practically all of the steep grades in Kansas City. After a number of trials in the spring of 1893 it was decided advisable to install a larger battery to increase the mileage capacity, and, as may appear peculiar with the methods of the present day, the machine was placed in a freight car and shipped to Philadelphia, where the battery maker was to make the new installation. En route the train was wrecked and the vehicle destroyed.

It will be understood that the early machines



First Electric Brake of America, Built by the Holtzer-Cabot Electric Company of Boston for Fiske Warren in 1893—This Machine Contained J. Anderson, William Carle, Theobaud Amia, E. H. Thielscher, George Innes, E. C. Newcomb, Albert L. Sawyer and August Andren.

driven by electricity were practical, but the storage batteries were of small capacity as compared with those built today, the jars were constructed of mate-

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rial that was brittle and easily broken, the cells were much heavier and the batteries constituted a considerable load, necessitating a consumption of a relatively



The Electric Vehicle Purchased by the General Electric Company in 1897 for Experimental Purposes.

larger volume of energy to drive the vehicle. The trials of road machines in 1893 at Chicago, and the following year in New York stimulated interest, and both in Europe and America considerable attention was directed toward the development of electric carriages. As may have been noted the first electric in Europe was designed for four passengers, but the first in America was for but one and Mr. Blood's was for two.

The third practical electric vehicle built in America was constructed in 1893 by the Holtzer-Cabot Electric Company of Brookline, then located in Boston, which was designed by the engineers of that concern. This was a distinct development as compared with Mr. Warren's first machine. So decidedly a progression was this conveyance that the following description is worthy of reproduction. The carriage was used for several years and a new motor was installed in it in 1895:

The Holtzer-Cabot Electric Company of Boston recently completed for a wealthy resident of that city an electric wagon modelled after the English brake, capable of seating six to eight persons. Its weight is 5100 pounds and it is of the most durable and solid construction throughout.

The batteries are contained in the body and under the front seat, and the top of cover of the body, which supports the two rear seats, is hinged so that it can be raised and thrown over against the front seat, leaving the cells and all connections accessible for examination or repairs. The batteries comprise 44 250 ampere-hour chloride accumulator cells with a nominal 10-hour discharge rate of 25 amperes. The cells are arranged in four groups of 11 each, and connected to the motor through a series parallel controller, which puts the groups in multiple series respectively, giving three speeds, five, eight and 15 miles an hour. These are controlled by a lever shown alongside of the steering shaft and locked in the various positions by engaging with a notched arc and spring latch. This arrangement gives three well defined speeds and no rheostat is needed. Although put to severe tests in hill climbing and over heavy roads, the batteries have been equal to the emergency. The running gear is very substantially built to stand the strain of heavy and rough roads without breaking springs or wheels.

In order to reduce friction the wheels are provided with ball bearings. The body of the wagon is water tight and water proof; paint has been liberally used so that under no circumstances can the breaking or spilling of a cell damage the motor or its connections underneath.

The steering is arranged at the hubs of the front axle, heavy crank levers being geared to the steering shaft, which is provided with a bicycle handle. A toothed segment with a spring latch is also arranged so that by a slight pressure of the foot the operator may lock the wheels at any angle. Notwithstanding its immense weight, the wagon can be guided by one hand at any speed.

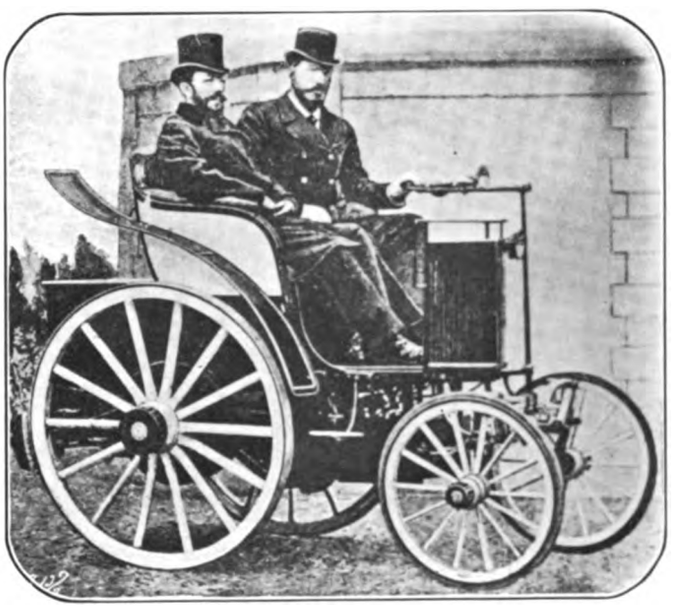
The motor is a special four-pole series wound, of 7.5 horsepower capacity and weighs 450 pounds. Its speed at full load is 250 rpm and its efficiency 89 per cent. A phosphor bronze armature pinion engages with a carefully cut intermediate gear, the shaft of which is divided and connected through a differential gearing, allowing the wheels to run at different speeds when rounding corners. The intermediate shaft drives the hind wheels directly by chains, one on each side. The motor and gearing are protected by a light leather casing.

For convenience in backing a reversing switch is mounted on the controller arc and interlocks with it so that the motor cannot be reversed until the controller is placed at "off." The speed may be varied from four to 15 miles an hour and all ordinary grades are accomplished with ease. The brake is of the usual coach pattern and has been found sufficient for all purposes. Two 10 candlepower lamps furnish light by night.

The wagon work was done by Chauncey Thomas & Co., carriage builders of Boston.

One of the first European electric vehicles to attract attention was that built by Berliet and given public trials in 1895, an illustration of which is shown. This was also a two-passenger type and it was steered with a lever at the side, the front wheels being small and turning under the body, the turntable of the animal carriage being retained. The battery was carried under the seat. The mechanical details of this vehicle are not available, although they would prove of decided interest.

Between 1893 and 1897 experiments to develop electric vehicles were carried on by a number of persons, there being decided interest taken in the possibilities of these machines. In these years the experimental work justified the belief that there were such qualities as were desirable in both pleasure and service conveyances. The Electric Vehicle Company was organized and a factory established at Hartford, Conn., in 1897, and the same year the Riker Electric Vehicle Company was located at Newark, N. J. Both concerns at first produced two-passenger carriages of the victoria type. Both concerns utilized the product of the Electric Storage Battery Company for current.

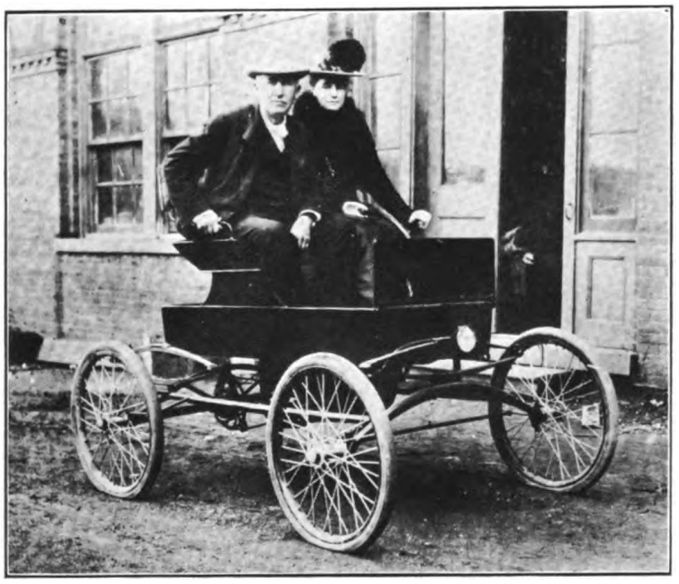


A Berliet Electric Carriage Built in France in 1895.

Both the Columbia and the Riker vehicles had distinctive features, those of the former being generally those to be found in the machines of the present day,

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but the Riker cars had numerous adaptations to meet the requirements of road service. One of these was the incorporation of a differential gearing in a rear hub instead of in the axle to secure the full strength of the construction, this being adopted for the pleasure carriages. Another was pivoting the front axles in the hubs of the front wheels to permit of turning, instead of the yokes and the steering knuckles, and the third was the use of perches, or reach rods connecting the front and rear axles, to maintain uniformity of driving stresses upon all four wheels. With the purpose of obtaining a flexible frame the end of one reach rod and a stay were brazed to the front axle. The corresponding end of the other rod was movable on the axle and was retained by collars. At the rear both rod ends were carried on mountings that were movable on the axle. The two rods were maintained in exact relation and stayed by a cross rod. The driving axle was a solid shaft driven by a chain from the armature shaft



The First Baker Electric Runabout, in Which Is Seated Mr. and Mrs. Thomas A. Edison.

of the motor by sprockets. Reference is made to this construction to show the different directions of experimentation with the electric vehicle.

The first electric service wagon was built in 1898 by the Riker Electric Vehicle Company, and three of these machines were constructed to the order of B. Altman & Co., New York City, they being of 500 pounds capacity. These differed from the pleasure car construction in that each rear wheel was driven by a separate motor, this design eliminating the need of a compensating gear in the rear axle, that member being solid. The front wheels were mounted with the pivots within the hubs, and the front and rear axles were connected with the reach rods or perches. The Riker pivoted front hubs were built with ball bearings of the cup and cone type, and the rear wheels revolved on plain bearings. The batteries were carried in boxes or cradles slung between the wheels. During the year three more of these machines were built for B. Altman & Co., by the Riker Electric Vehicle Company. B. Altman & Co. has the distinction of being the first concern in the world to employ a fleet of electric delivery wagons. The bodies were of the panel design and were built by F. R. Wood & Son.

While the electric machines were simply an adjunct to the large delivery equipment of the Altman company, and were probably installed primarily with a view of their advertising value, it is a surprising fact that one of these wagons is in regular service today and is doing such work as to justify its regular use with the latest constructions. It is stated that some of the others are still serviceable. From this beginning the company has constantly added to its electric wagons and has as consistently lessened the number of animal transports.

The first experimental work of the General Electric Company with relation to electric vehicles was carried on with a machine bought in 1897 and which was tried and observed at the factory at Lynn, Mass. An illustration of this vehicle is shown.

The Pope-Waverley Company was established in 1898 and this concern began the production of a light runabout of the buggy type, the bodies being of piano-box design and intended for two passengers only.

The first five-ton electric truck was built by the Riker Electric Vehicle Company to the order of the Moet & Chandon Champagne Company and delivered to that concern early in 1899, this having all the characteristics of the smaller machines. This was as well the first large truck driven by any power, and it was a curiosity as well as an entirely dependable equipment.

The Baker Motor Vehicle Company, Cleveland, though organized in 1898, did not place a machine in the market until 1900, and that was a light runabout with the usual piano-box body that appeared to meet with decided approval.

The Riker machines were a success from an electrical point of view and were in every way dependable, but because of the limitations of batteries and the comparatively small radius of movement, combined with the lack of knowledge of the people, were not regarded with favor. Mr. Riker directed his attention to other types of vehicles and associated himself with the Locomobile Company of America, which first built a steam carriage and later on gasoline cars. With his retirement from the pleasure and service wagon field this left the Electric Vehicle Company, the Pope-Waverley Company and the Baker Motor Vehicle Company as the principal, if not the only producers of electric pleasure machines, but the Vehicle Equipment Company was formed to produce service wagons of all kinds, and this concern marketed its first wagon in January, 1901. Later on the Electric Vehicle Company built service wagons, these differing in every way from the pleasure car designs.

As may have been assumed, each firm engaging in building electrics sought to perfect its machines. To follow the experience of each builder and designer

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even in briefest form would require many volumes. It is, however, desirable to refer to some developments that are worthy of the attention of every one interested in electric vehicles. The Immisch and the Holtzer-Cabot vehicles were the first in Europe and America to have the motors suspended transversely in the chassis, both utilizing the motor armature shafts for driving. The Baker was the first in which the motor was contained in an axle housing, there being direct drive by the armature through shafts on which the wheels were fixed, this being a semi-floating construction. The differential was contained within the axle shell with the motor. The axles of the Baker machines were connected with perches or radius rods, this maintaining a correct relation. The Riker characteristics have been stated.

The early pleasure cars were heavy and limited to a comparatively small radius because of the weight and lack of battery capacity. Not only this the actual knowledge of the batteries, with reference to care and maintenance, was limited to a comparatively few persons, and the production of current was seldom with a view to the development of electric vehicle use. Motors as built in the late 90's were as thoroughly dependable and enduring as those of today, and there were available numerous devices for regulating and controlling the use of current, but one great deterrent to general adoption was cost. It is worthy of note, however, that with the attention of the large electric manufacturing concerns directed toward the production of motors, controllers, charging panels, automatic controls and regulators and other essential equipment for vehicle and garage use and the battery manufacturers endeavoring to perfect their batteries with a view of lessening weight and increasing capacities, the industry made substantial and enduring progress.

One thing that developed the electric motor, without reference to the possibilities or the requirements of the builders of electric vehicles, was the enormous demand for these machines for industrial purposes, and especially railway work. It was as essential to control railroad cars as road machines and this entailed the perfection of the controller. Besides this the need for storage batteries impelled the makers to improve them in every respect with regard to service, endurance and economy, and here again was a condition that was stimulating to the makers of vehicles.

It was merely following standard mechanical practise to employ ball and roller bearings in electric car and wagon construction. The main object was to minimize friction and increase mileage. With the use of such bearings the service was materially improved and the expense of operation lessened. With pleasure cars endeavor was made to minimize weight and to increase comfort and convenience. The complications were few and different forms of drives were employed, these increasing in number with the developments from experimental and service tests. The differential was very generally adopted; with many of the makes it was incorporated with the jackshaft. The individual wheel motor was abandoned by a number after extended experience and with the use of the chain drive with jackshaft reduction, although this is still used in different forms by three concerns.

(To Be Continued.)

WILL DOUBLE SIZE OF PLANT.

Demand for Philadelphia Storage Batteries Makes Imperative Added Facilities for Production.

The Philadelphia Storage Battery Company at Ontario and C streets, Philadelphia, Penn., is shortly to erect an addition to the structure now occupied by it that will very nearly double its factory production. The factory is a modern two-story brick building of modern construction, a section of the second floor being given over to the offices.

The demand for the batteries, especially the Philadelphia thin plate type, has been such that it could not be supplied, and plans were made for the extension of the building to twice its size in ground area occupied and to the same height. It is expected that the work will be pushed to completion that the company may have as quickly as is possible the productiveness that is necessitated by the service of its batteries.

NEW BAKER TRUCK CATALOGUE.

Well Designed Publication Which Gives Specific Information of Complete Line for Coming Season.

The Baker Motor Vehicle Company, Cleveland, O., has issued a new catalogue of electric service wagons it builds that is decidedly interesting. The booklet is unusually well designed and printed, and differs from the average production description in that it is given over largely to illustrations showing the different forms of work for which Baker vehicles are used. There is a brief statement as to the actual value of electric wagons and an emphasis of the qualities that should be considered by all who require vehicular transportation, and then follows a summary of the mechanical construction of the chassis. This section of the catalogue is illustrated by side and plan views of the different types of chassis, which differ principally in size, and on the pages with these views are some of the specifications of the model shown.

The catalogue gives specific information of the Baker 3.5-ton truck, one of which was recently built for the United States Bureau of Printing and Engraving at Washington, and of the Baker service runabout, which is shaft driven through bevel gears. This is designed especially for light, fast service. In addition there is an outline of Baker tractors, which are built in three sizes and designed for hauling trailers. The catalogue is decidedly comprehensive and valuable from the fact that it demonstrates some of the possibilities of electric vehicle service.

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ELECTRIC TRUCKS IN TEXTILE SERVICE.

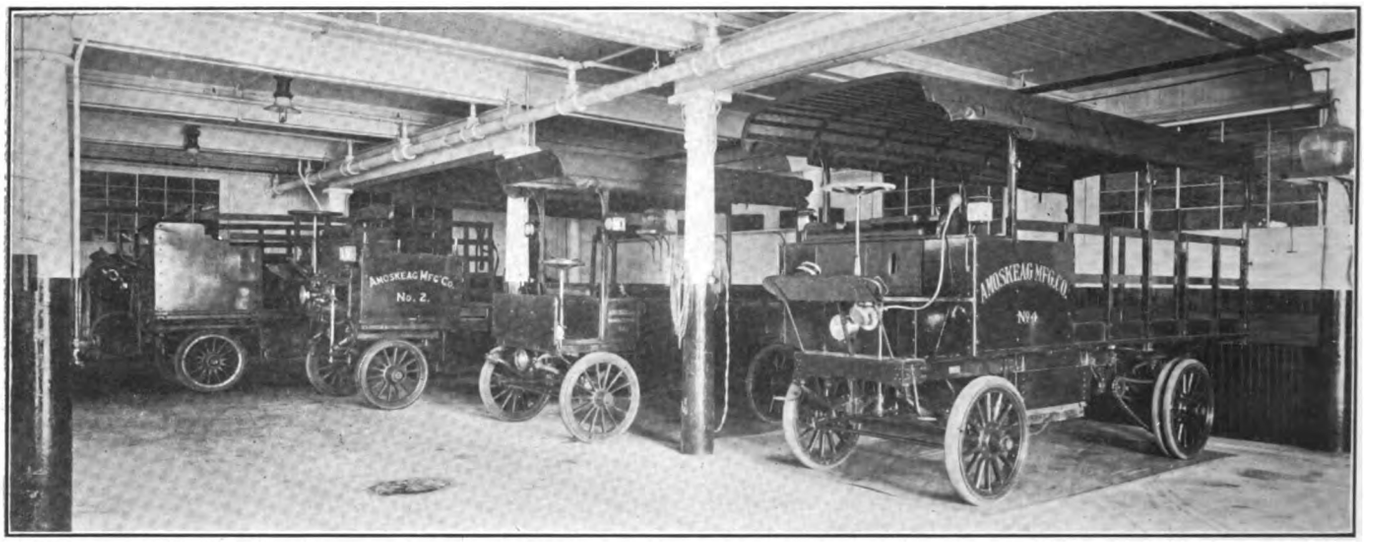
MANUFACTURING today is the science of production with reference to quality and volume, and success is absolutely dependent upon economy. There may be exceptions where a product is sufficiently protected that it cannot be imitated or a substitute found, but universality of use is limited only by the cost. While it is the endeavor of every manufacturer to improve quality and to cheapen expense of producing, it is evident that economies cannot be brought about unless the accounting is such as to establish cost to an exceedingly small fraction of a cent.

There are so many influences affecting manufacturing and the units are so small and numerous, that what may appear to be a ridiculously minute sum will in the aggregate be a comparatively large amount of money, and dividends may depend upon the ratio of the cost and selling prices measured by the thousandths of a cent. This is particularly true of textile manufacturing. New England has for more than a century been the location of the largest concerns in America manufacturing cotton and woolen cloths, this being due largely to the fact that these industries were established before the expansion of the country, and that at the time of establishment the natural resources for power were utilized so far as possible.

Not only this, but during this century the people of New England have become experts in this industry and with the creation of homes and family ties it was logical enough that additional mills were built and help sought where operatives could be secured who could produce the class of goods desired. All this has not been changed materially with the development of the industry, and today the mills of the eastern part of the country are long distances from the sources of supply of raw materials and fuel, and it is necessary to pay heavily for transportation of the material and supplies, as well as for distributing the finished products. Competition has been developed to a state where the buyer considers simply the price he must pay, and with the consumer the cost is the governing factor in his choice.

Textile manufacturers have studied the problems for years and so far as possible have improved their facilities and equipment that the production shall be increased, while labor has insisted upon shorter working hours, and as capital must always have a margin of profit it has been necessary to establish systems that will in every way be productive of economies.

Transportation charges have for many years been considered with extreme care, and in many instances mills and shops have been located with a view of minimizing vehicle haulage, but until the production of mechanical vehicles animals were utilized and with the usual uncertainty as to expense. Strangely enough, despite the system generally applied to every other mill department, little attention was given to vehicular transportation, and when the possibilities of motor wagons and trucks were brought to their attention the men who would not hesitate to spend thousands of dollars for an improvement that would economize production, challenged the suggestion of the practicality of automobile vehicles and demanded facts and figures that could not be applied more than generally at best, and which could not be regarded as being more than an example.



Interior of the Garage of the Amoskeag Manufacturing Company, Manchester, N. H., in Which Is Kept Its Fleet of Seven Electrics.

In some instances manufacturers have been so much impressed that they were willing to undertake to educate themselves by working the machines in their own service, and by studying the work accomplished and the methods employed learn wherein it was possible to decrease the cost of the work performed with animals or accomplish more work at no greater cost. The history of the pleasure automobile is well enough known to the majority of readers, but where a business proposition is under consideration the tendency has generally been to experiment, and under condi-

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tions that would be looked upon as in every way unproductive of good results.

Were a manufacturer to place an improved ma-



One-Ton Wagon of the Fleet of Six Utilized by the Pacific Mills, Lawrence, Mass.

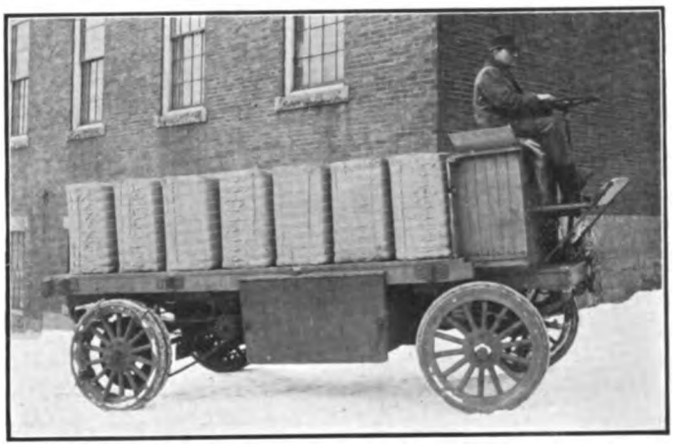
chine beside what he had been using he would be able to see in a comparatively short time the merits of the new and its special value to him, but he would not delay utilizing methods that would secure the fullest measure of productiveness of the new, and he would be perfectly willing to replace his entire equipment to bring about a more satisfactory product or to lessen the cost. Yet when he placed a motor vehicle in his service and contrasted its work with what had been done with animals he generally was or is unable to fix definite economical facts because of the lack of proper accounting of his haulage expense.

There are concerns, of course, that have possession of records that will establish without doubt the value of the motor wagon, but this information has not been general publicity, and very frequently it is withheld because of the belief that were this knowledge to be utilized by competitors it would be quite as economical to them, and there would be no actual value in the service because rivals would have the same opportunities for economy. It is not probable that this attitude would be acknowledged by the majority of men, but it is an indisputable fact that data are refused as a rule by manufacturers, often with the statement that records have not been well kept. Regarded from this point of view, it is surprising that concerns that have taken up motor vehicles as an economy have neglected to obtain the facts that would establish the value of the vehicles to them, which would appear to be most important of all knowledge sought, and it must be accepted that if this statement is correct the methods employed could not be expected to realize the service possible with a practical system.

Turning to the use of vehicles by textile manufacturers it will be understood that many have found a decided saving in installing them, and this is true of those who have systematically accounted their work and expense and contrasted these facts with the actual or estimated expense of horses. It is impossible to regard the work necessary about the mills as an average, as each service requirement differs materially, but where some demands haulage of fuel, supplies of all kinds, raw materials, and the finished goods to the bleacheries or print works, or to the railroad or steamer terminals, others have but a comparatively small part of this work to perform. Not only this, the highway conditions are extremely varied and the influence of this upon expense is something that cannot be averaged, while the cost of labor is another important factor in establishing expense.

It has been invariably the experience with those who have utilized motor wagons in their haulage that changed methods as compared with those used with animals were imperative, and the fact that this has been realized by some has deterred the adoption of the new form of transportation, because there are many who do not care to make what would be necessary transition of what may be regarded as a system. As a matter of fact it is doubtful that any person would be willing to consider what is a cause of unnecessary expense an endurable condition, yet it is surprising that so many men, knowing the extravagance of animals from every viewpoint, are willing to continue their use.

It is undoubtedly true that many of the concerns are small and it is also a fact that many of the mills are located on the lines of railroads for obvious reasons, but there must necessarily be haulage of differing classes which is necessary that the mills be operated. In the selection of the type of motor vehicle to be used for the mill there are many reasons why the electric ought to be considered. The one that has seemingly appealed to many manufacturers is the opportunity to utilize current, for the majority of manufactories are today lighted by electricity, and the power plants are generally equipped for its production at the least possible cost. There may be issue taken with the necessity of charging the vehicle nights after the service of the day on the ground that this would entail operation of the power plant for a considerable number of hours in excess of normal requirements, this causing a considerable expense, and yet it



Two-Ton General Vehicle Wagon Engaged in the Haulage Service of the Pepperell Manufacturing Company, Biddeford, Me.

is a fact that the auxiliaries usually operated in plants of this kind are sufficient to meet any reasonable demand and with practically little additional cost.

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Another quality that must necessarily appeal to the men who is seeking economy is the unquestioned endurance of the electric vehicle in all services. There



One-Ton General Vehicle Wagon with Special Equipment Used by Pepperell Manufacturing Company, Biddeford, Me.

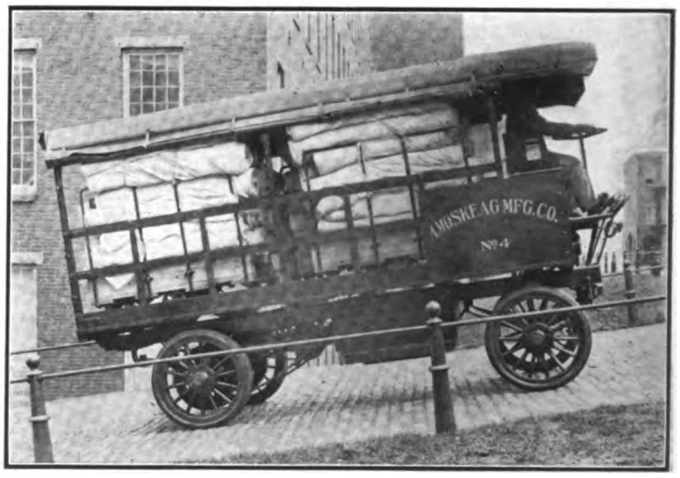
are many electric trucks in operation in New York that have been in daily use for 10 years or more, and these are giving good mileages and with such economy that they are retained in service with those of more modern construction. There has been one difficulty in the past, and that is securing the services of electricians competent to properly maintain the machines, and yet the desirable men are becoming more numerous daily and they are available for all who care to engage them.

While it cannot be said that there has been general adoption of the electric vehicle in textile service it is a fact that the corporations that have adopted them have continued their use and have added to the number, and with the experience of from one to six years it must be believed that had weaknesses or serious fault been developed these would have been deterrents against additional purchases. Going over the list of concerns that are using electric machines it will be realized that they represent the largest and most progressive in the industries, and that they are widely known and successful because of the policies of the men who control them.

Perhaps one of the most striking examples of the use of the electric vehicles may be seen at the Amoskeag Manufacturing Company's plant at Manchester, N. H., a corporation that is regarded as the largest producer of cotton cloth in the world, and which has equipment and facilities worthy of the place that it occupies in manufacturing. This company is located inland and much of its power is obtained from the Merrimac river. Railroad facilities are admirable and arranged to obtain the most economical service, so that haulage is minimized, but there is a large volume of work that must be performed by highway vehicles and a large part of this is done with a fleet of seven Electric Vehicle and General Vehicle wagons and trucks.

The company's plant is located on the banks of the river and there are numerous grades, several of them being steep and sharp, but these would have effect on haulage of any kind. An idea of one of these ascents may be gained by an accompanying illustration. Starting with one machine the company has added to its equipment the sizes that were believed best for the purpose, so that now its wagons and trucks range from one to five tons capacity. The company has established a garage, which is admirably equipped, and in this the machines are given the attention and care required. The company maintains its property at a high state of efficiency and this applies to the electrics as well. They are operated by a system that is productive of extremely consistent results, and no matter what the weather conditions the machines are always serviceable and doing the work required. It is true that the maintenance of the vehicles is one reason for the success with their use, and perhaps the largest factor in their economy is that they are not neglected, but this policy existed when animals were used and in this respect the service is at parity.

Another illustration is afforded by the Pacific Mills at Lawrence, Mass., which has five General Vehicle wagons and trucks in operation and it has ordered another of the same make. The company has experience with mechanical vehicles extending over a period of nearly four years, and it now has but a single horse in use. One of the most interesting phases of this installation is that the hauls are short and yet with this character of service the company is doing its work at a cost of 80 per cent. of the expense for horses, this fact being known through highly systematized records which were utilized first with a view of minimizing the animal expense. There is no denial of the strength of this comparison, nor of the facts developed. The company has erected an ideal garage and maintains a well equipped repair department in which its machines are housed, and by the use of a system that accounts for the time of every driver and each truck, which obviates delays in the delivery and receipt of freight, which places the responsibility of the opera-



Two-Ton Wagon, One of the Seven General Vehicle and Electric Vehicle Machines Worked by the Amoskeag Manufacturing Company, Manchester, N. H.

tion of the machines on one man and the burden of maintenance on another, it has reached an efficiency that could hardly be excelled. One thing that im-

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presses itself upon the observer is the fact that horse methods have been forgotten and the work of the vehicles has been planned with the same care that



The Nashua Manufacturing Company, Nashua, N. H., Uses Two of These General Vehicle Machines in Its Regular Service.

factory production has been developed, this being considered absolutely essential. It is a decided contrast with the policy of those who have not believed that haulage is worthy attention and systematizing.

The Arlington Mills, Lawrence, Mass., has in its service three Studebaker electric trucks that have been in use for several years, and these have been found to decidedly economize the haulage in the yard and the city. The machines have been well cared for and operated with discretion, and they have proven to be satisfactory from every point of view. The company has a small garage in which the trucks are stored and it provides its own current from its power plant. The company has utilized the vehicles a sufficient length of time to demonstrate their practicality and usefulness from every point of view, and has at no time needed to recourse to any other means of transportation.

The Pepperell Manufacturing Company, Biddeford, Me., has used two General Vehicle wagons for several years, one of them being of a ton and the other of two-ton capacity. The larger machine is utilized for general freight work and the other is worked a part of the time carrying cloth from the weave shed to the finishing department. For this work an open express body is used and the cloth is placed on a special floor truck in the weave shed and when the wagon is backed to the door of the shed the truck is pushed into the wagon body, which it is designed to fit. In this way the handling is expedited and the time of the wagon economized. As an evidence of what has been accomplished with this method it may be said that the wagon and two men has replaced seven men and two single horse wagons, and the work is as well if not better done. During the extremely cold Maine winters and in heavy falls of snow the two electrics have been worked with entirely satisfactory results.

The Nashua Manufacturing Company, Nashua, N. H., is using two electric trucks that have been in service for several years, this being a result of the work done by the Amoskeag installation. The work is largely of the same character, mill yard haulage and some outside transportation, and this, too, has been in every way satisfying to the officials of the company. The company's first vehicle was followed after a reasonable period by the second, and then a small garage was equipped, where the machines are cared for. The expectations for economy have been in every way realized, and the prospects are that they will be further increased.

The Cocheco Mills, Dover, N. H., which corporation is controlled by the same interests that maintain the Pacific Mills, has two electric trucks in use, one of these being a five-ton machine that is equipped with a dumping body and is utilized for coal haulage a considerable part of the time. The other is worked in transportation. As might be assumed the vehicles are well cared for and maintained at a high standard, and, being systematically worked, have been economical and extremely serviceable as compared with animal service.

The Glenlyon Dye Works, Phillipsdale, R. I., which is a department of the mammoth Saylesville bleacheries at Saylesville, R. I., utilizes one five-ton electric truck, which has been in constant use for about a year. This vehicle has been worked every day and throughout all kinds of weather, and has given extremely satisfactory mileage at comparatively small cost.

Baker Salesmen's Convention—Baker Motor Vehicle Company's agents and salesmen to the number of nearly 150 attended the annual convention of the selling organization of that concern, which was held at the factory at Cleveland, O., Oct. 16-18. Much enthusiasm was manifested in the machines the company is producing and in the fact that during the first half of 1912 the development of the company exceeded that of any other similar period. This applies to both pleasure and service vehicles and there was a general



One of a Group of Three Studebaker Trucks in the Service of the Arlington Mills, Lawrence, Mass.

belief that the last part of the year would be even more productive of results. The outlook for 1913 was conceded to be equally as promising.

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The MOTOR TRUCK
Devoted to Motor Driven Business Vehicles of All Classes.

VOL. III. NOVEMBER, 1912. NO. 11.

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Anonymous communications not considered. Correspondence on subjects relating to trucks, delivery wagons, taxicabs, tractors, all motor driven farm, fire and municipal apparatus, the motor industry and the trade, will receive attention. Stamps must be enclosed to insure return of unsolicited contributions.
Entered as second class matter, February 25, 1911, at the Postoffice at Pawtucket, R. I., under the Act of March 3rd, 1879.

STATEMENT OF THE OWNERSHIP, MANAGEMENT, CIRCULATION, ETC.

Of The Motor Truck.....Published **Monthly** at **Pawtucket, Rhode Island,** required by the act of August 24, 1912.

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WILLIAM H. BLACK.

Sworn to and filed with Postmaster October 1, 1912.
ROSCOE M. DEXTER,
Notary Public.
My commission expires June 30, 1914.

MOVING THE RECORD CROPS.

The reports from all sections of the country indiate that bumper crops are the rule, but past experience suggests this will have no appreciable effect upon the so-called high cost of living, unless some plan is devised whereby the annual shortage of railroad cars is relieved. And right here the motor truck offers a solution of the difficulty at both ends of the line.

The grower who substitutes the mechanical transport for the more antiquated horse or mule wagon, relieves the situation by loading the cars to capacity, whereas in former years it often has been necessary to start the cars on their way to the eastern markets when only partially loaded. This plan has not only resulted in a higher freight charge in the aggregate, but has delayed subsequent shipments, by reason of the fact that the cars were in the East waiting to be unloaded at a time when they should be in the West to take on another load.

The motor truck also can aid at the receiving end, since it is possible, leaving out of consideration for the moment the quick loading and unloading devices, to cut down the hauling time required with horses. Given the ability to load the cars to their full capacity in the West and to reduce the time required for unloading in the East, there should be no reason for a shortage in railroad cars, while the cost of delivering the products of the soil to the ultimate consumer should be reduced in a proportionate degree.

THE OVERLOADING PROBLEM.

With rare exceptions mechanical vehicles are overloaded by the users. Few owners will establish a limit for load weight and insist upon it being observed. The majority will overload and believe they are making a profit by so doing, but they will fail to provide means or facilities for quick handling of the freights, when there is more actual loss than could be compensated for by hauling twice the capacity of the machine at a single load.

There must necessarily be an allowance for loading and unloading. The man who is utilizing motor wagons must make such provisions as will minimize the time of men and vehicles at the place where freight is received for haulage, and it is imperative that those to whom the freights are sent should have facilities for quick delivery. The railroads charge demurrage on cars when unloading is delayed. Idle transports mean a loss to them. With the business man, whose delivery is limited, lost time is even more expensive.

There are circumstances which justify some delay, but those should be known and means taken to minimize retardation of service. Failure to make such provision is plainly a fault that can be placed. The power wagon has every quality that can be desired, and if these are not utilized to the greatest advantage it is patent that the methods are wrong and should be replaced by a carefully arranged system.

Overloading does not compensate for negligence or absence of organization. Hauling excessive weights is not a gain, any more than overworking an animal or a man. This can be avoided. Absence of a perfected delivery is lack of business capacity and the loss would be quite the same, no matter what the form of conveyance used.

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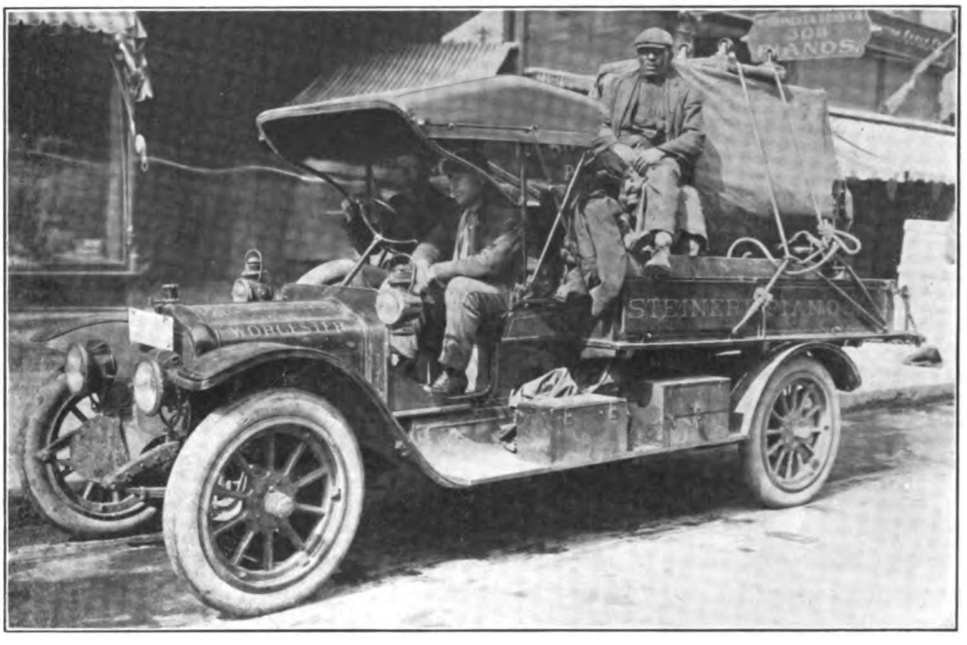
WHITE TRUCKS MAKE SPLENDID SHOWING.

Experiences of Two Worcester Concerns Indicate That Transfer Men Can Study Problem of Motor Haulage with Satisfactory Results in Economy and Efficiency.

By C. A. French.

CONSIDERING the number of mechanical transports now being utilized in all kinds of commercial work, it is somewhat surprising to note that men engaged in the general transfer business apparently have not given the subject of motor haulage the attention that its importance deserves. George Wilmot of Worcester, Mass., a man who has been in the trucking business for over 40 years, and who may be assumed to understand some of the problems it presents, declares that the man who does not use motor trucks must get out of business. His statement has specific reference to his particular line.

Mr. Wilmot is senior member of the firm of Geo. D. Wilmot's Sons, 94 School street. His experience with commercial motor vehicles dates back some 2.5 years, when a two-ton car was purchased. The make of this first machine is not material. It may be stated that it is still in service in Worcester, although it was not sold to its present owner by the Wilmot concern.



White 1500-Pound Wagon, Utilized by Geo. D. Wilmot's Sons, Worcester, Mass., in Piano Moving Work.

"I have always said that it costs the first truck for experience," says Mr. Wilmot. "When we bought this car we were told that while it was a two-ton machine, we could carry three tons on it all right. That was not true. We tried it, and we know now that no two-ton truck ever should be expected to carry three tons. We know more about trucks today than we did then.

"We knew so little about trucks at the time that we employed a chauffeur, who considered he had done his full duty when he drove the machine as fast as it would run. I don't believe he gave any consideration to the matter of oiling, or tightened a nut or a bolt, as long as we had it—18 months. That it failed to do its work successfully, certainly was no fault of the truck, but I'm sorry for the man who owns it now, and I'm glad he hasn't had our experience with it."

This appears to be a very frank statement, and undoubtedly it explains in a measure the reason some transfer men have abandoned the motor vehicle after a brief trial, and why still others have never given the subject careful consideration. Perhaps the surprising feature of this situation lies in the fact that Geo. D. Wilmot's Sons was able to understand the difference between use and abuse.

For the past year the concern has employed a 1500-pound White wagon, made by the White Company, Cleveland, O. It was purchased for piano work and it is kept busy in such haulage practically all of the time. Once in a while it carries a light load of furniture, and some of these trips have been out of town, as far as Springfield, a distance of 50 miles. The results obtained on these out-of-town trips have been such as to warrant the company in ordering a three-ton White truck for use in moving work exclusively.

"Five years from today," declares Mr. Wilmot, "the man who is moving anywhere within a radius of 100 miles will consider nothing but a motor truck. It not only gives him better service, but does the work in less time and at a saving in money. Our charge for moving work is $1 a mile, one way. That would make the Springfield job come to $50. It would cost a man $75 by railroad and the same by team. In the former instance he would be four or five days without his goods and in the latter, at least two. With the motor truck he could cook his breakfast on his own kitchen range in Worcester and cook his supper on the same range in Springfield. Add the hotel bills to the haulage charges I have mentioned and you will be able to get some idea of the saving in expense. The only way to escape

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this extra expense is by imposing on the generosity of friends at one end of the line or the other."

That Mr. Wilmot's figures are by no means excessive is borne out by his further statement that his firm recently undertook a contract for removing goods from Worcester to Jacksonville, Fla. Of course, everything in the house had to be packed and crated to withstand the journey by rail and boat. Two men were employed seven days in this work alone, and at a cost of $240. This expense would have been eliminated entirely by loading the goods directly onto the motor truck, and there would have been absolutely no danger of breakage.

But to return to the 1500-pound piano wagon: It has averaged 40 miles a day, and the average gasoline consumption has been 18 miles to the gallon. It has been oiled every morning. The tires have given an average of 5000 miles to a set, these being pneumatics, as is necessary in carrying pianos. The present chauffeur has a different conception of his responsibilities and has cared for the truck in a manner which has called for no expense for repairs, worthy of mention.



Atherton Furniture Company's 1.5-Ton White Truck Delivering Goods in Suburbs of Worcester, Mass.

In the piano work one gang of four men is able to do the work for which two gangs, or eight men and four horses, were employed formerly. On the out-of-town trips it has done the work of six horses. The saving in expense has been such that the truck has earned from $30 to $40 a day, "lots of days," according to Mr. Wilmot.

In deciding upon the purchase of an additional truck for hauling furniture, the Wilmot concern was influenced largely by the experience of the Atherton Furniture Company, Front street, Worcester, with a 1.5-ton White, which has been in service for over a year. This vehicle is utilized in making deliveries from the furniture store to a large number of suburban towns and about the city as occasion requires.

According to Mr. Fowler of the Atherton company, this White car covered 14,000 miles last year, on a gasoline consumption of 10 miles to the gallon. It is shod with Morgan & Wright pneumatic tires, single in front and dual in the rear, and these have averaged 4000 miles to the set. It has replaced two two-horse teams in the work for which it was purchased. The company is so well pleased with the service given by it that a second White of 1500 pounds capacity has been purchased.

While exact figures are not available in either case, a comparative estimate of the cost of these two vehicles, with the horses they are able to replace, is shown in accompanying tables. These figures are based upon the statements of Mr. Wilmot and Mr. Fowler as to what the respective items have cost. In the matter of driver's salary it is placed at $12 a week for the horse drawn equipment and $15 for the trucks, and these should be understood as in the abstract, neither Mr. Wilmot nor Mr. Fowler caring to make public the amount of salary paid. It is assumed however, that the truck operator would be paid something more than the horse driver, since it has been proven, in the Wilmot case, at least, that it pays to secure a man with the proper qualifications, and to offer sufficient inducement with that object in view.

It has been mentioned that Mr. Wilmot has been in the trucking business for over 40 years and his statement that it costs about 60 cents a day to feed, bed and care for one horse will be accepted as correct. The other items in the horse equipment table are based upon similar statements by Mr. Wilmot and others in Worcester, who have kept careful record of their horse costs in such work.

In the case of the 1.5-ton truck, it should be remembered that the tires were pneumatics, and the cost a mile would be lower proportionately with solid equipment, such as probably will be employed on the three-ton White purchased by the Wilmot concern. If the pneumatics will show a saving of practically $300 a year over horses, there can be little doubt as to the economy afforded, particularly under what may be regarded as more favorable conditions. That there is efficiency has been demonstrated beyond question.

Mr. Wilmot says that with the 1500-pound wagon one gang of four men does the work of eight. This appears to give an increase of 100 per cent. in efficiency. Mr. Fowler says the 1.5-ton truck does the work of two two-horse teams and it must be presumed that this ratio would hold good with reference to moving work, particularly as he declares the efficiency of the vehicle could be increased still further were it possible to devise some means of quick loading, a problem for which present conditions at the loading platform

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at the store do not afford a satisfactory solution.

As far as the smaller car is concerned, the figures leave little room for argument. The estimate, based upon Mr. Wilmot's figures, shows a saving of nearly $1000 a year in operating the equipment. To this may be added the wages of three extra helpers (one member of the second gang of workmen having been cared for by the item covering drivers), a matter of another $1500 at least. Mr. Wilmot claims a profit of $30 to $40 a day.

If it be assumed that the 1.5-ton vehicle also represents an efficiency of 100 per cent. in this work, then the $1500 may be added to the saving on that installation as well. There is small wonder that the Wilmot concern has decided upon the purchase of an additional White machine. It ought to make a much better showing than that of the Atherton company, particularly as the vehicle is to be operated largely on long distance hauls, where frequent stops will not cut down the gasoline consumption or the tire mileage. The experiences of these two concerns would seem to indicate that there is much reason for giving the subject thorough consideration on the part of those engaged in the general transfer business.

Annual Cost of Two Two-Horse Wagons.

Feed, etc., @ 60c a day a horse	$876.00
Two drivers, @ $12 a week each	1248.00
Depreciation, horses, 20% on $1300	260.00
Depreciation, wagons, 20% on $800	160.00
Depreciation, harnesses, 20% on $140	28.00
Interest, 6% on $2240	134.40
Total for horses	$2706.40

Annual Cost of 1500-Pound White Wagon.

Gasoline and oil	$101.40
Driver, @ $15 a week	780.00
Tires	250.00
Depreciation, 20% on $2250	450.00
Interest, 6% on $2250	135.00
Total for 1500-pound White	$1716.40

Annual Cost of 1.5-Ton White Truck.

Gasoline and oil	$178.40
Tires	675.00
Driver, @ $15 a week	780.00
Depreciation, 20% on $3000	600.00
Interest, 6% on $3000	180.00
Total for 1.5-ton White	$2413.40
Balance in favor of 1500-pound White	$990.00
Balance in favor of 1.5-ton White	$293.00

FACTOR IN FARM LIFE.

Packard Motor Trucks Bring Produce to Market and Will Reduce Living Cost.

The Packard Motor Car Company, Detroit, maker of Packard trucks, has sold through its New York branch a number of such vehicles to farm owners in the region immediately surrounding the Metropolis. They are hauling everything required for farm use in the way of raw materials, fertilizers, etc., including coal and other commodities, and in their trips to the city markets or railroad stations are transporting every variety of farm produce, from barrels of apples to loads of hay.

At the famous Arcadia farms in Duchess county, New York, one Packard truck is doing the work of from eight to 12 horses. One man can drive the truck, but it would take two, four or six to drive the horses. The mechanical transport is expected to be one of the great factors of the future in reducing the cost of living. The ability of the man who grows fresh vegetables and other produce near the large cities to get his product to the market in one-fourth or one-fifth the time required by horses and at a saving usually from 30 to 50 per cent. in the cost of transportation, will result in increased production with a corresponding decrease in cost.

ONE-TON TRUCKS EXCLUSIVELY.

Federal Company of Detroit Rated as Largest Maker of This Type in the World.

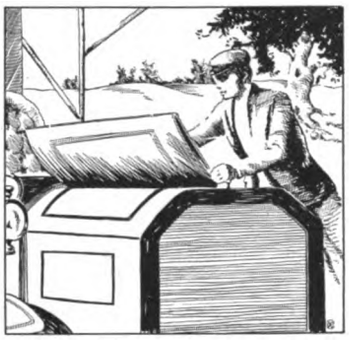
It is maintained by the Federal Motor Truck Company, Detroit, that at is the largest exclusive maker of one-ton trucks in the world. Inasmuch as this is held to be an age of specialties and specialists, the Federal company naturally takes much pride in this rating, and the idea is carried out in every department. Constructing but one model, the company claims that it is thus possible to produce a fully guaranteed vehicle at a low price.

The Federal is built in two sizes, model C having 110-inch wheelbase and model D 114. The former is equipped with bodies designed for conveying small articles of heavy weight and the latter for carrying large bulky loads, such as furniture, etc.

These vehicles are now represented in over 100 different lines of business and are giving satisfaction in every detail. These lines also include chassis fitted with motor 'bus bodies, and the new combination chemical and hose wagon for fire department service. During the past two years Federals have been distributed widely throughout the United States and a great many have been shipped to foreign countries. The output for 1912 will be over 1000 cars, and the orders and repeat orders for the coming season indicate that between 2000 and 2500 will be needed to supply the demand in 1913.

Peerless in Express Business—The American Express Company, which has over 20 Peerless motor trucks, made by the Peerless Motor Car Company, Cleveland, O., in use in various parts of the country, has recently purchased seven additional three-ton Peerless vehicles to be used at Cleveland. Three of these have already been delivered and for the past few weeks have been collecting freight packages throughout the city and carrying them to and from trains. In a short time the Cleveland traffic of the American Express Company will be completely motorized. Over a year ago the company, which is one of the largest users of motor trucks in the country, tried out a few Peerless trucks and since then has ordered others at short intervals.

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HINTS·FOR·PROPER MAINTENANCE

A Department for the Owner, Driver and Repairman.



GAS TANK RACKS.

Service stations and garages make it a practise to carry a number of gas tanks for the benefit of their customers. In the larger stations the tanks are kept in the storeroom under lock and key, but in some garages they are placed in the office for safe keeping.

An easily made and inexpensive rack for storing tanks is depicted at Fig. 2 and it may be located at any convenient place. It is constructed of wood and the inside dimensions of the shelves are two feet, six inches long, nine inches high and eight wide. These dimensions will accommodate the largest sized tank.

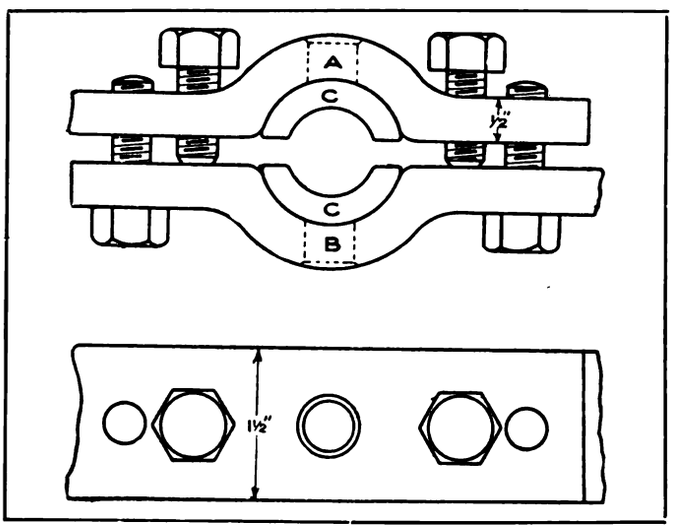


Fig. 1—Grinding Tool for Crankpins and Wristpins Where Grinder Is Not Available.

The number of shelves will depend upon the number of tanks to be stored.

The shelves should be given a slight pitch, about .5-inch higher in front than at the rear to retain the tanks, and when the rack is built against the wall the rear partition may be eliminated. If desired a door may be fitted and provided with a lock.

GRINDER FOR WRISTPINS.

In fitting a new wristpin to a piston and when the former must be made and hardened, it is likely to become warped in the process. Ordinarily a grinder would be employed to correct any misalignment, but when such is not available the work may be performed by means of a home made grinding clamp, as shown at Fig. 1.

The clamp is made easily by bending two plates of iron as illustrated in the drawing. It is fitted with four screws, two of which are employed to hold it apart and the other two together, thus enabling the adjustment of the halves to the diameter of the work being ground, and yet rigidly with regard to each other.

The two metal laps C are made as follows: The clamp is laid on its side on a flat surface on which is spread a thin layer of putty to prevent leakage of the molten metal. The spindle to be ground is held in the centre of the opening, the gaps and ends of the hole stopped with putty, and molten type metal, lead or tin, is poured in the remaining space. The holes A and B being countersunk prevent the laps falling out of the clamp, as the metal running into these forms plugs with enlarged ends. The clamp can be used on work running in the lathe, or as in the case of crankpins, rotated by hand. Oil and emery are used as an abrasive.

JIG FOR FILING WASHERS.

Many times washers are employed to take up lost motion and as a rule the stock washer is either too thick or too thin for the purpose. Reducing these members by filing is not only difficult, but it is hard work to hold them in the vise, as well as to file them even.

At Fig. 3 B is shown a simple method of accomplishing the work. As will be noted the washer is imbedded in a block of wood, taking care to have at least half of the washer above the surface of the holder as shown at C. It is then an easy matter to place the work in the vise and file the washer evenly.

HOME MADE TAP WRENCH.

In the care of the truck the driver who undertakes his own repairs is called upon to perform work that requires special tools, such as a tap. Although a monkey wrench may be utilized with this tool, it is poor practise, as the pressure applied is uneven and the tap is likely to be broken.

If the garage is not equipped with a tap wrench

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one may be constructed easily and at a slight expense. At Fig. 3 A is shown a home made device the material for which comprises two strips of iron or steel,

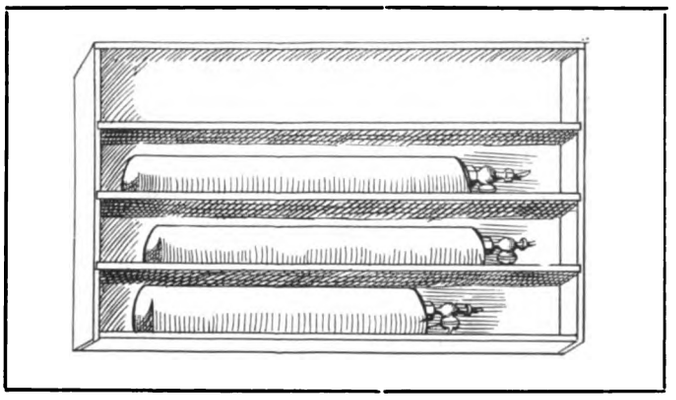


Fig. 2—Easily Made and Inexpensive Rack for Storing Gas Tanks.

four or five inches long, .25 thick and .375 inch wide. A recess is cut in either piece, as illustrated in the sketch, for the purpose of securing the head of the tap. The pieces are locked by means of set screws or bolts as indicated. The screws may be of any convenient length in order to allow the use of different sized taps.

AUTOMATIC VALVE GRINDER.

Considerable progress has been made in the construction of machinery for replacing work on the motor car formerly accomplished by hand. As valves require periodical grinding, more or less time is consumed in the operation, this depending upon the condition of these members. In grinding valves it is essential that the tool be rotated in one direction and reversed from time to time, also lifted so as to prevent the abrasive material bunching up and scoring the valve and its seat. It is likewise important that the pressure applied to the tool be slight but constant.

The Specialty Machine Company, 95 Liberty street, New York City, has brought out an automatic valve grinder which is claimed to perform the work as successfully as by hand and in much faster time. As will be noted by the illustrations presented at Fig. 6, the device is similar to a breast drill in construction. It comprises a frame having an oscillating arm, a bevel pinion, a driving rod for the valve and two plain gears with a turning crank. Other components of the tool consist of a cam, a roller, a clutch and a spring.

The tool is operated as follows: When the turning handle A is rotated, the crank B rotates in the slot C, imparting a reciprocal motion to the arm and segment D, which reciprocates the small pinion E. The crank I transmits this motion to the driving spindle H. The gear G is driven by the small pinion K. Located on the inside of the large gear is a cam which periodically comes under a roller mounted on the carrier L, and lifts the clutch from engagement, holding it until the pinion E has rotated through a given arc, whereupon the cam drops the clutch back into engagement. The movement also lifts the valve from its seat. The spring M is employed to insure the engagement of the clutch at the proper time and to provide a constant pressure. The nut R locks the valve on the rod H. The weight of the tool and operator's pressure is carried on the shoulder N and the valve opening on the motor.

The cycle of operations is said to be so continuous that the valve is ground evenly, and seated accurately. First the valve is reciprocated on its seat for a number of times, is then lifted and released by the cam, and automatically placed in a different angular position on the seat, next automatically moved forward through a given angle and then reciprocated as before. The pressure between the valve and its seat is held constant and controlled by a spring of uniform pressure, and the compression of this spring M varies in accordance with the size of the valve and the design of motor. The automatic valve grinder is constructed of high grade material and is moderately priced.

SCREW CUTTING DIES AND HOLDERS.

Screw cutting dies and holders form a valuable addition to the tool equipment of the repair shop. The Remington Tool & Machine Company, Boston, is manufacturing a screw cutting die which is constructed in two parts, with a heavy rigid hinge formed integral with one side, the construction being shown at Fig. 4 B and C, respectively. A taper hole at the top of the die provides for the reception of the tapered point of the adjusting screw in the elastic die holder D. Adjustment for expanding or contracting the die is thus accomplished without removal from the holder. The hinge and taper point form practically a solid die.

A quality claimed of the tool is that it is instantly accessible for sharpening, there being ample clearance

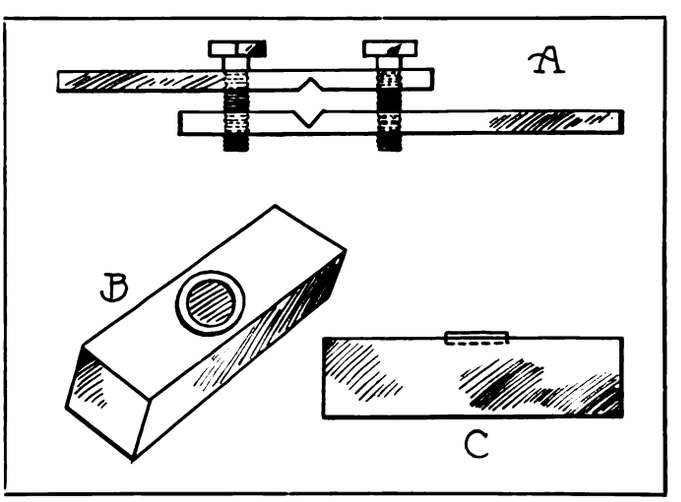


Fig. 3—Suggestions for the Driver-Repairman: A, Home Made Tap Wrench; B, Method of Retaining Metal Washers When Filing Is to Be Done; C, Showing How Washer Is Imbedded in Wooden Block.

for an emery wheel or lapping with diamond powder. Another feature emphasized is that in the event of particles of metal lodging between the teeth of the die

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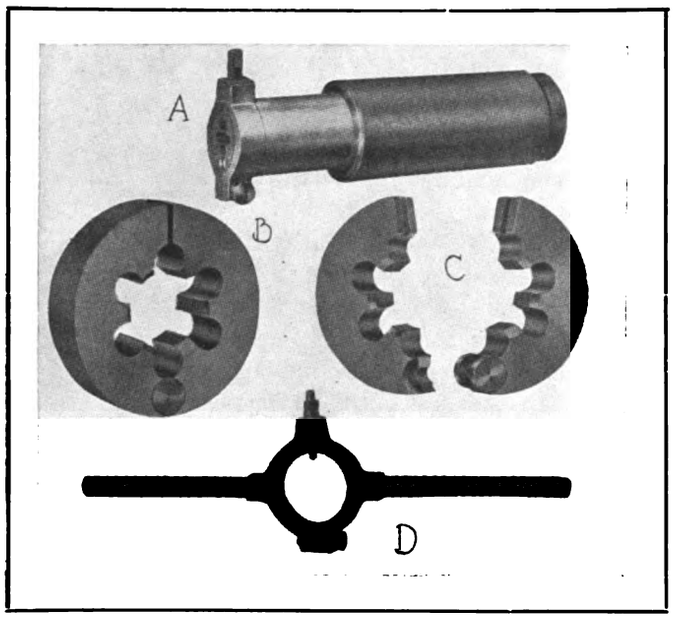


Fig. 4—Remington Screw Cutting Dies and Holders: A, Tool Employed with Lathe; B, Adjustable Die; C, Showing Construction of Hinged Die; D, Elastic Die Holder.

they may be removed easily. Efficiency is secured through accurate alignment by means of the sharp cutting teeth and the maker states that a single cut makes a perfect thread. It is also claimed that the die may be resharpened as long as any appreciable portion of the teeth remains.

For bench work the die can be used in holders of the ordinary pattern, but the elastic die holder shown at D is recommended. For machine work the holder illustrated at A is employed.

CAUSE OF NOISY BRAKE.

The driver of a delivery car noted that the foot brake located on the rear of the transmission chattered each time the member was utilized. Several remedies were tried without success. Finally it was discovered that the drum was loose on the shaft. The end of the latter was a straight square and the drum was fitted loosely. The trouble was eliminated by placing four steel strips, .005 inch thick, one on each face of the square, and pressing the drum over them.

CORRESPONDENCE.

Measuring Pitch of Gears.

(16)—Kindly inform me how to measure the pitch of a gear. J. F.

Brooklyn, N. Y., Oct. 5.

In the sizing and cutting of gear wheels the terms diametrical and circular pitch are used. Diameter, when applied to gears, is always understood to mean the pitch diameter. The diametrical pitch is the number of teeth to each inch of the pitch diameter. For example: In diametrical pitch if a gear has 40 teeth and the pitch diameter is four inches, there are 10 teeth to each inch of the pitch diameter and the diametral pitch is 10, or to express it in other words, the gear is 10 diametral pitch.

Circular pitch is the distance from the centre of one tooth to the centre of the next, measured along the pitch line. For example: If the distance from the centre of one tooth to the centre of the next is .5 inch, the gear is .5-inch circular pitch.

If the diametral pitch is required and circular pitch is given, divide 3.1416 by the circular pitch. If the latter is desired and the diametral pitch is given, divide it by 3.1416. The number of teeth required may be obtained by multiplying the pitch diameter by the diametral pitch when these are given. When the outside diameter and diametral pitch are known and number of teeth required is desired, multiply the outside diameter by the diametral pitch and subtract two. The pitch diameter may be obtained when the number of teeth and diametral pitch are known by dividing the number of teeth by the diametral pitch.

The thickness of the tooth at the pitch line may be obtained by dividing the circular pitch by two, or 1.57 by the diametral pitch. The whole depth of the tooth required may be secured by dividing 2.157 by the diametral pitch.

The Brown & Sharpe Manufacturing Company, Providence, R. I., produces steel rules for sizing wheels, and the instruments are so calibrated that measuring is an easy matter.

Governor for Motor.

(17)—Will you please advise me how to make and fit a governor to my delivery car? My driver displays a tendency to overspeed the machine on his return trip from the suburbs, to make up lost time. I want a governor that will hold the motor to not over 20 miles an hour at the best. Any suggestions you may make will be duly appreciated. L. K. M.

Boston, Oct. 7.

The usual method of governing is by reducing the amount of vapor to the cylinders; that is, obstructing the inlet pipe. This may be accomplished by fitting a butterfly valve or rotating plug valve in the pipe, this

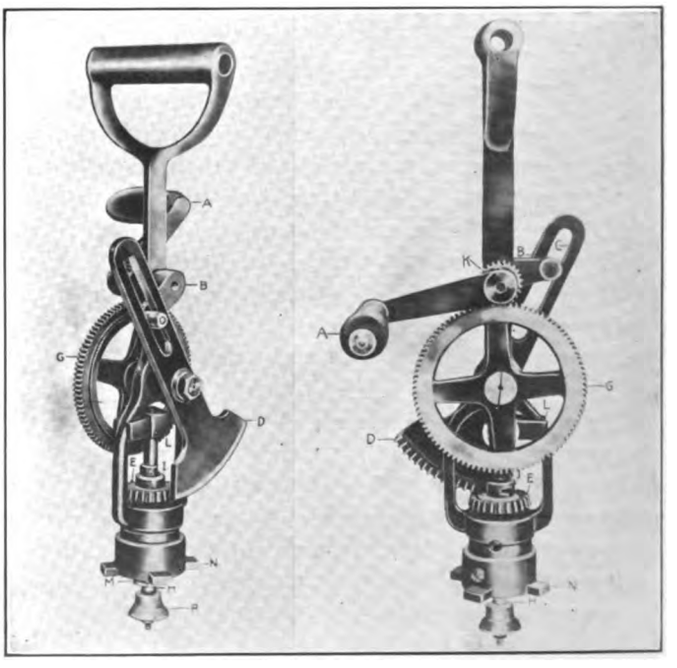


Fig. 5—The Automatic Valve Grinder Imparting Reciprocal Movement to Valve as Well as Lifting Latter from Its Seat.

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being actuated directly from the governor. At Fig. 6 is shown a centrifugal governor and two methods of application.

At A is depicted a method of controlling the supply of mixture to the motor. In this a is the half-time or two-to-one shaft of the engine, and mounted upon it is the gear wheel b, which consequently revolves with it. The governing weights o o are attached to the wheel by arms which move freely on studs, and the former have continuations h h at right angles. The ends of these arms bear against the sleeve c, which slides freely upon the shaft a when pressure is applied, but which is normally pushed against the arms h h, by the spring s. A spring p connects the weights, and tends to draw these toward each other. In the chamber or pipe y is a butterfly throttle valve which governs the admission of mixture to the combustion chamber, and the object of this governor is to control this valve, which is accomplished in the following way:

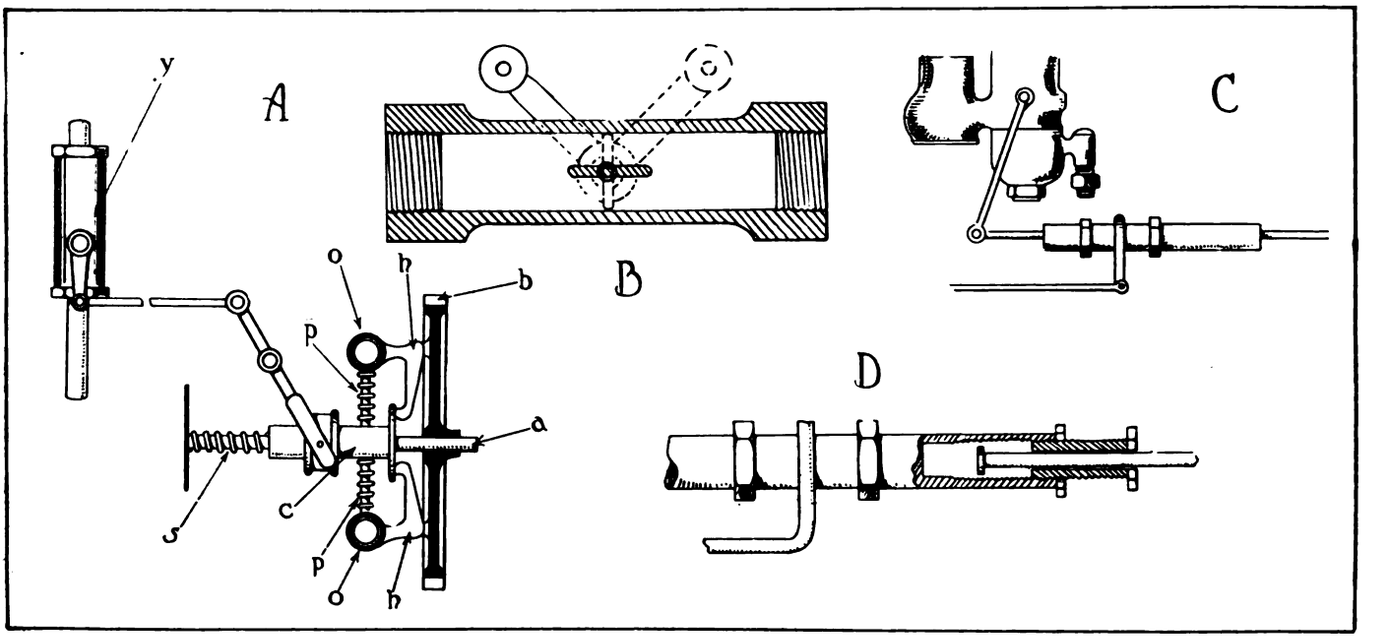


Fig. 6—Suggestion for Installing a Governor: A, Method of Incorporating Valve in Intake Pipe; B, Construction of Butterfly Valve; C, Connections to Carburetor; D, Adjustable Rod Device.

The spring s is so adjusted as to hold the sleeve c against the arms h h until the engine attains a predetermined number of revolutions, while, by means of an accelerator in the form of a hand or foot lever, the spring s can be assisted to hold back the sleeve c. When this sleeve is held against the arms, the governor does not come into action, and the throttle remains fully open. When the motor is started the gear wheel b, and with it the weights o o, revolves, and centrifugal force tends to cause the latter to fly outward, a tendency which is resisted by the spring p. As the number of revolutions of the motor increases, the centrifugal force overcomes the resistance of the spring p, the weights fly out, and the arms press against the sleeve c. A further increase of speed creates additional centrifugal force which, at a certain point, overcomes the resistance of the spring, the sleeve moves along the shaft a, and the throttle begins to close, reducing the charge in the cylinders. This has the effect of slowing the engine, and the throttle opens again, either partially or wholly, according to the movement of the accelerator.

The drawing shows the general principle upon which the centrifugal force is conveyed from the governing weights to the throttle valve. The arms push the sleeve c, the latter actuates the fork on a rod which is pivoted. At B is presented the butterfly throttle valve, the dotted lines depicting the valve closed and the relative position of the actuating lever.

A method of employing the governor with the rod leading from the lever attached to the throttle of the carburetor is illustrated at C. Here the rod leading from the hand throttle is equipped with a forked member, fitting over another rod which is threaded to take two nuts, these being for the purpose of adjusting the lead and retaining the fork. This is shown at D, which sketch also shows the method of fitting the rod leading from the governor. The former is held by a threaded adjustable member through which it moves freely.

When the governor is in action the rod attached to it moves until the headed portion makes contact with the threaded member and a further movement of the sleeve on the governor actuates both rods and closes the throttle. The latter is fitted with a spring for the purpose of opening when the speed of the motor decreases and the sleeve of the governor returns to normal position. The fork attached to the hand throttle permits of regulating the opening of the carburetor in the usual manner. The action of the governor rod may be regulated by the threaded member by lengthening or shortening as the case may require.

The mirrors or reflectors of the headlights will become dirty, especially if not protected by coverings. Ordinarily the deposits may be removed by using tissue paper. If not, a little warm water, soap and a soft cloth will accomplish the work successfully.

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FOREIGN TRUCK NOTES OF INTEREST

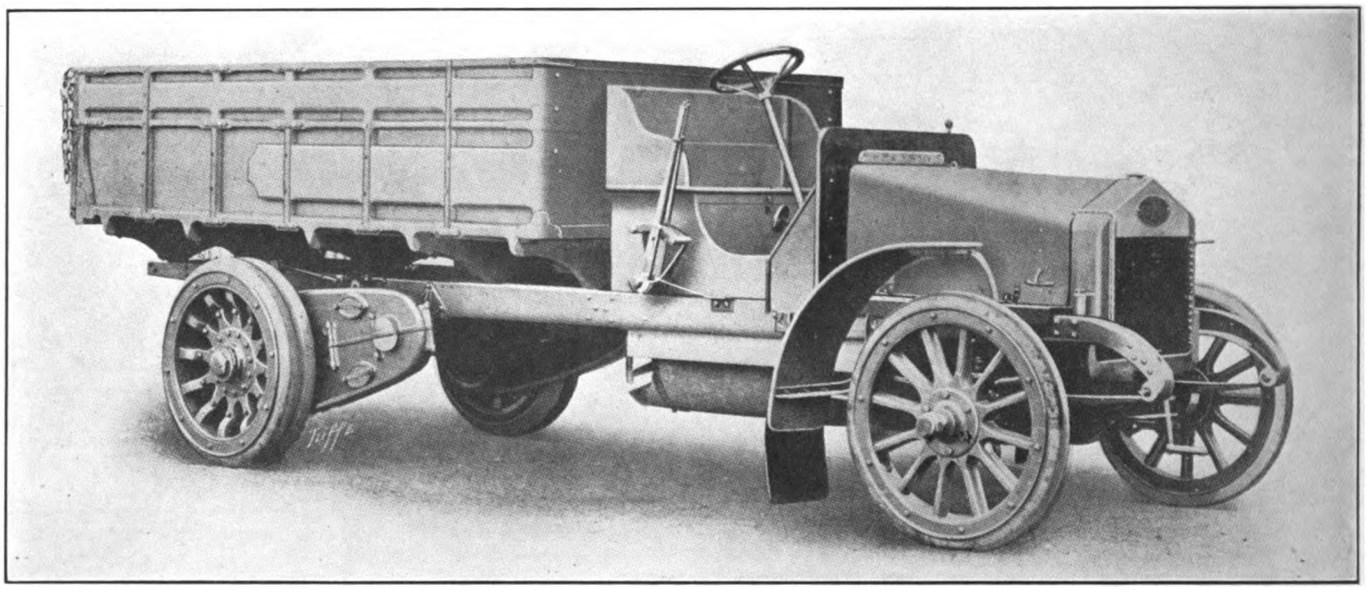
MOTOR TRUCKS IN IRELAND.

Road Conditions Are Held to Be Ideal for Their Use Throughout the Island.

Although there are upwards of 9000 automobiles in use in Ireland, the manufacture of them there is confined at present to a single factory, located at Belfast. However, an additional plant is to be built at Dublin in the near future.

Ireland's business firms make use a of great number of commercial vehicles. This is highly practicable, for the reason that of the country's 54,000 miles of public highways, at least 50,000 miles are in splendid condition for traffic and the county councils are daily making them better by the use of the steam roller. Ireland is today an ideal country for the carrying on of motor traffic.

The fire brigades of Belfast and Dublin have fallen in with the progressive idea. The type of motor fire engine used in both cities is identical, and very soon Cork and Londonderry also will have their motor fire brigades.



Two-Ton Hallford Chassis of British Manufacture, Fitted with General Service Wagon Body.

HALLFORD TWO-TON WAGON.

Type of Vehicle Which Has Demonstrated Its Economy in Commercial Service in England.

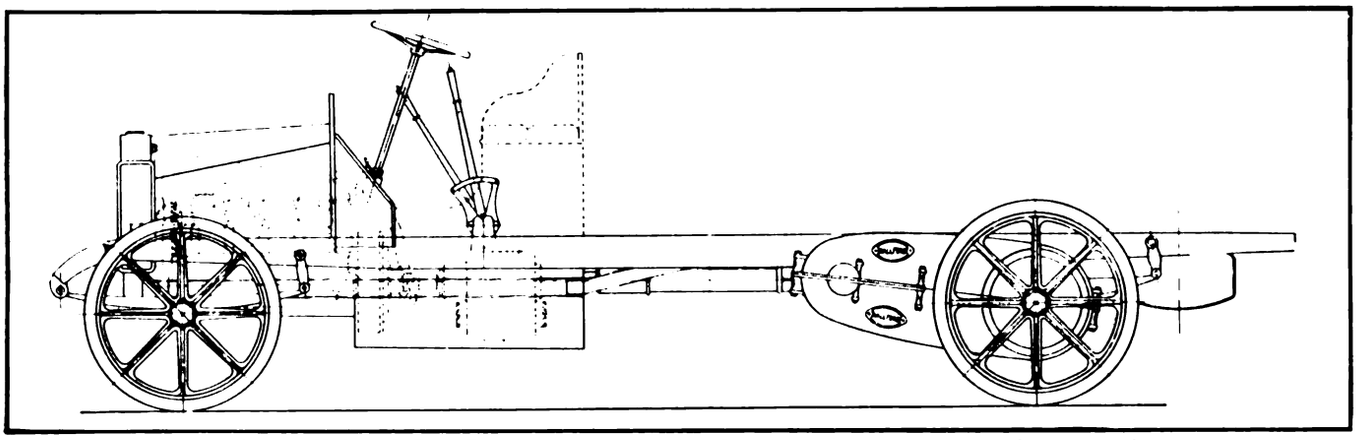
Since the commercial interests in Great Britain have been turning their attention to the subject of motor haulage, in a manner more nearly approaching the study of the problem in America, there has been a most consistent demand for facts and figures concerning the comparative cost of horses and motors. In this respect, British manufacturers are in a somewhat better position to give adequate information, for although trucks have not yet come into as general use abroad, they have been employed in certain lines for a much longer period than in this country.

J. & E. Hall, Ltd., Dartford, Kent, maker of Hallford vehicles, is a pioneer manufacturer of mechanical transports, having been established in 1785 and for a number of years in the very front rank among British engineers. The two-ton wagon presented herewith, represents the latest development along this line, but cars of this capacity have been in service in various sections of the British Isles and in the Colonial possessions for a number of years. Reliable figures, therefore, are available, from which it is possible to secure complete and accurate data.

In the first place, it should be stated that the Hallford two-ton wagon is fitted with a 25 horsepower, four-cylinder motor, with crankcase of aluminum. Inlet and exhaust valves are made from nickel steel. The timing gears are entirely enclosed in the oil chamber. Ignition is by Bosch high-tension magneto. Cooling is by water, circulation being maintained by a pump. Power is transmitted by a special form of friction clutch to the four-speed transmission and differential, final drive being by chain.

Two sets of brakes are fitted, one acting on a drum on the gear shaft, and the other on drums in the rear wheel hubs. The frame is of pressed nickel steel. Springs are long and of special resiliency. Wheels are of cast steel, mounted on ball or roller bearings, and

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Side Elevation of Hallford Two-Ton Chassis, Indicating Location of Motor and More Important Components.

the tires are guaranteed for 10,000 miles by their maker.

Translated into American money, the experience of these vehicles in service, indicates the following as an annual average comparison between them and horse drawn equipment, covering a service of 80 miles a day for 300 days:

Annual Cost of Four Two-Horse Teams.

Four teamsters @ 28s a week	$1362.62
Food and bedding @ £40 a year	1557.28
Shoeing @ £3 a year	116.89
Veterinary's charges @ £1 10s a horse	58.40
Rent @ 7s 6d a week a team	379.58
Maintenance, wagons and harnesses	97.33
Depreciation, horses, wagons and harnesses @ 15%	467.18
Interest on investment @ 5%	155.72
Total for horses	$4195.00

Annual Cost of Hallford Two-Ton Wagon.

Driver @ 35s a week	$425.81
Tires @ 2d a mile	973.30
Gasoline @ 9d a gallon	545.00
Lubricants	87.59
Maintenance, chassis @ 12.5%	252.84
Maintenance, body, @ 10%	14.60
Depreciation, chassis and body, @ 15%	321.19
Storage @ 5s a week	63.26
Interest on investment @ 5%	128.96
Total for truck	2812.55
Balance in favor of motor	$1382.45

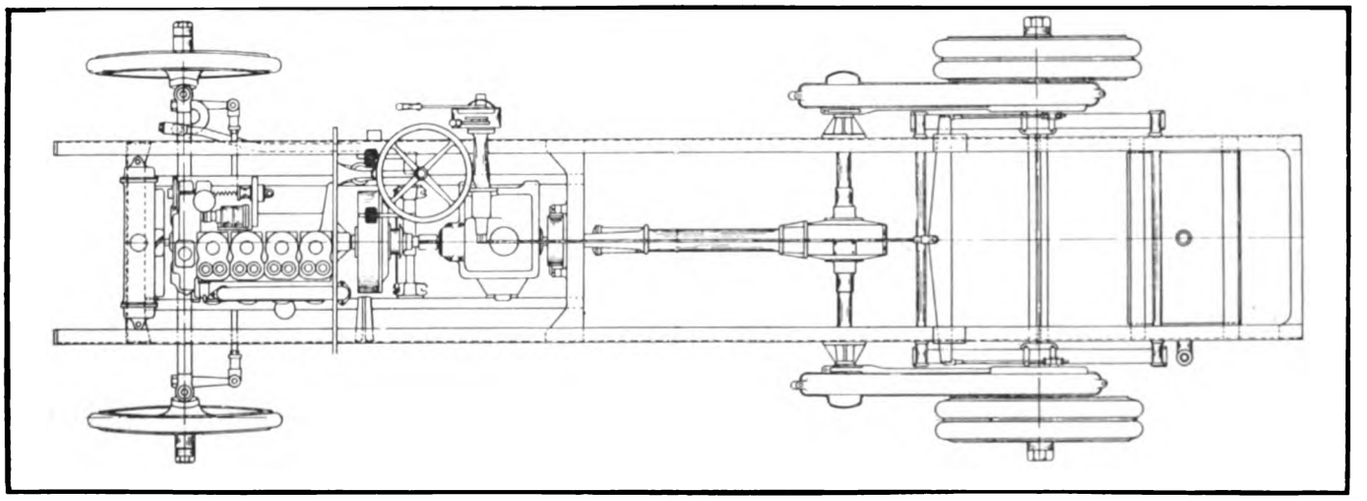
In considering these figures it should be remembered that the cost for labor and some other items is not as much in England as in America. On the other hand the price of gasoline, for instance, is more than on this side. While it will be impossible to make American conditions conform exactly to those represented by the above table, it should prove of decided value in determining the economy to be effected by motor trucks.

OPPORTUNITY IN CHINA.

Reports from New Republic Indicate Possibilities Are Good If Properly Followed Up.

From recent reports there appears to be an excellent field in China for the introduction of motor commercial vehicles. The country thus far has been decidedly slow in adopting this modern form of transportation, although it is stated that two firms have placed motor wagons on the roads in and about Shanghai. The Aerated Water Factory of Shanghai will soon possess a motor delivery truck, with which it hopes to transport a large supply of goods a considerable distance into the country.

Many Chinese merchants have had the advantage of motor trucks brought to their attention, but few have seen fit to place orders. It is the opinion of those on the ground that if firms in the automobile business were to approach several of the larger concerns having export departments they may find business possible by such Chinese connection. The merchants of the Celestial empire desire particularly to be informed upon the cost and upkeep of motor vehicles.



Plan View of Hallford Two-Ton Chassis, Presenting Simplicity of Design and Accessibility of Components.

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KING GEORGE APPROVES MOTORS.

British Ruler Very Favorably Impressed by Results Obtained in Recent Army Manoeuvres.

The British army manoeuvres have been concluded and King George, in reviewing the events, places stress upon the value of the motor truck in army work. While this is not the first year that the motor vehicle has played a part in military trials, nevertheless the demonstrations this year have proved a revelation of its worth and has led to its adoption as a permanent means of transporting troops and baggage. The use of these vehicles was greatly opposed by a certain faction of the military authorities, which held that they were impracticable. However, motor trucks were used extensively in an effort to establish their real worth for such service. The success of the great fleet of machines of all makes and types was gratifying and the war department will set about securing automobiles amply sufficient for its use in the future.

In the past it has been necessary for the army officers to plan their movements carefully and with precision as it was not possible to get too far ahead of the supplies. This year this was different and the infantry movements were made possible at a considerable distance from the base of supplies, owing to the ability of the trucks to transport necessities at a greater distance and more quickly. In this year's manoeuvres the army was forced to move faster and camp stores and equipment were of necessity moved from place to place, but this work was accomplished with more readiness than would have been deemed possible in former years.

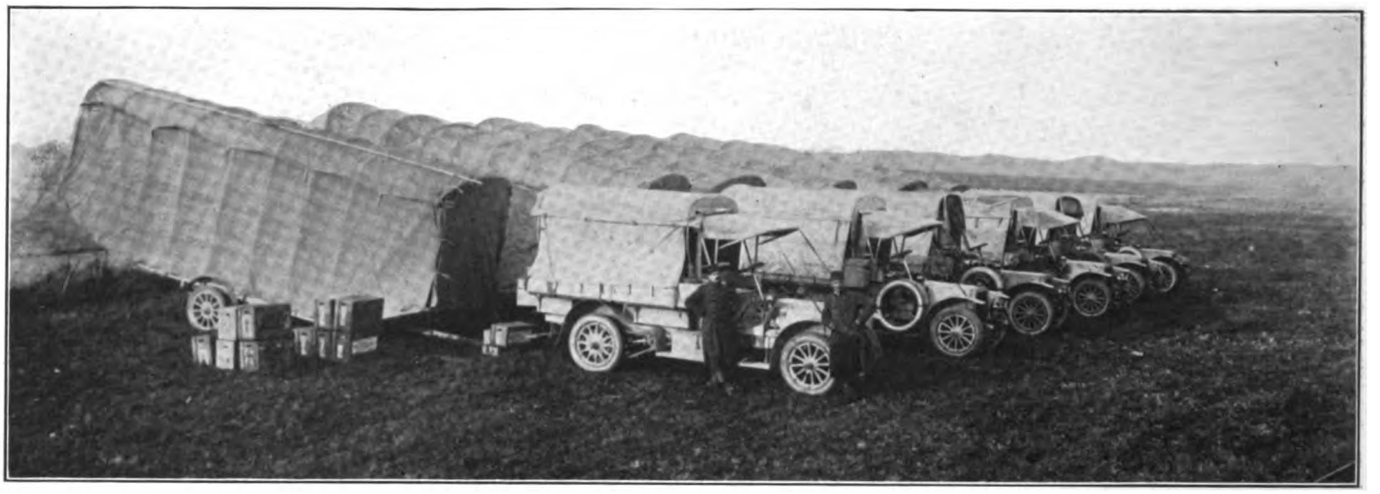
This method placed a severe test on the transport fleet, but their successful effort was of great advantage to the manoeuvres which thus had a wider latitude than would have been possible under the old arrangements. Supplies, which with horse drawn vehicles arrived at camp in poor condition, were delivered quickly and in an excellent and healthful state. Accidents were minimized, the one or two mishaps being quickly cared for by the mechanics which accompanied the fleet with a complete machine shop on wheels.

TRUCKS WITH AERIAL ARMADA.

French Army Vehicles Play Important Part in Success Achieved by Aeroplane Corps.

The recent formal review of an aeroplane armada by Alexander Millerand, French minister of war, at Villacoublay, France, when no less than 72 French army aeroplanes, with their full complement of pilots and observers, and their attendant park of motor trucks carrying supplies and equipment, proves of historic interest. It was the first time that the armed aerial force of any nation had been assembled under like conditions, and at its conclusion 20 of the aeroplanes arose in a "flock," encircled the parade ground for a few minutes and flew away to the eastward to resume their stations on the German frontier.

An accompanying illustration shows a portion of the motor trucks employed by the French army as attendants for the aerial corps. The method of transporting the aeroplanes on trailers behind the trucks is indicated, and it may be added that the supplies and necessary equipment are carried within the enclosed bodies of the vehicles. France has developed this feature of modern warfare somewhat further than most nations, and the picture herewith has a significant bearing upon the present situation in Continental Europe.



Park of Motor Trucks Attached to the French Army's Aeroplane Armada, at Recent Review in Villacoublay.

INDIA WANTS MOTOR 'BUSES.

Engineering Publication Advocates Their Adoption in Place of Tramcars for Passenger Transportation.

Indian Engineering, a publication issued at Calcutta, India, makes some interesting observations relative to the future development of that city, as well as Delhi and other places. Considering an address made to the Tramways & Light Railways Association in

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England by Engineer Pott of the Metropolitan Electric Tramways Company, it suggests that motor passenger vehicles be installed in preference to any other form of transportation.

It states that Calcutta and other places will soon be called upon to decide which form of transportation it will have upon the new roads that will be opened both within the existing limits of the city and proposed extensions. It cites the fact that motor 'buses are cheaper in first cost than tramcars and urges their purchase on the grounds that their advantage will be greater with each improvement in design and development.

TRAVELLING MAIL BOX.

England Trying Out New and Novel Method of Posting Letters on Motor 'Bus.

The motor car has again demonstrated its usefulness as a speedy carrier and the residents of Ombersley, England, are now getting their mail at regular intervals by means of a motor 'bus, which has been equipped with a letter box in which mail matter can be posted by any person along the route to Worcester. Previously it was necessary to send mail by a somewhat circuitous route through Droitwich.

Residents complained of the slow service given to them, when it was suggested that a box be placed on the horse drawn 'bus which then served the locality five times daily. This has since been superseded by the faster motor vehicle and mail is now swiftly carried between those points. The Worcester postal officials have the key to the box and upon the arrival of the 'bus it is cleared of all mail, which is then delivered to its destination.

GENERAL NEWS FROM ABROAD.

Transporting Beef in South America—Several South American beef concerns have placed motor trucks in commission and the matter of greatly extending the service is being considered seriously. It is understood that numerous trucks are to be added in order to carry large quantities of beef from the slaughter houses directly to the dock of shipment.

King Alphonso and Spanish Show—It is announced that next year's international exhibition at Barcelona, Spain, will be opened officially by King Alphonso in January and will remain open until April. Arrangements have been made with the customs department so that all exhibits will be admitted free of duty. Continental manufacturers have already responded freely to the appeal, particularly in Germany, and many British firms have made arrangements for allotments of space. Nearly all makes of motor vehicles will be represented at the exhibition. The Anglo-International Permanent Exhibitions, Ltd., London, possesses full information of the coming show.

Agricultural Test in South Africa—The Port Elizabeth Agricultural Society, Port Elizabeth, South Africa, has decided to offer a prize of about $700 for the best motor tractor shown at work with disc or other plows, in a series of field trials which will be held early next April. Those interested can obtain information by writing to the secretary of the society at Port Elizabeth.

Olympia Show in July—The commercial vehicle committee of the British Manufacturers' association has finally selected July of next year for the holding of the 1913 industrial motor show at Olympia, London, England. This decision was made after full consideration of the dates upon which the building would be available. It is probable that the show will open the third Saturday of the month.

Want Delivery Cars in Australia—Melbourne and Sydney, Australia, are said to be poorly provided with parcels delivery systems and it is necessary for many large retail firms to maintain large fleets of vans, many motor trucks among them, to accomplish the delivery of small parcels. It is stated that if an enterprising firm of carriers desires to establish a carrier service system in either city, the business prospects would be excellent.

Subvention Trials in Germany—Sixteen truck manufacturing concerns will take part in the Prussian war office's annual run for the subvention placque, including the two new aspirants, Alderwerks and Genruder Stoewer. The 16 also include two Bavarian houses, the trials for the Bavarian placque materializing simultaneously with those organized by the military staff at Berlin. Starting at the Prussian capitol the trucks and trailers will cover a circuit of 2054.6 kilometers in 22 working days, which means a daily average of 93.4 kilometers, or 58 miles. The rules governing the trials this year are more exhaustive and severe than ever before.

Show in German East Africa—A motor show is to be held at Sar-es-Salaam, German East Africa, in 1914, and the Colonial Economic Committee at Berlin, Germany, has decided to secure a large exhibition of German machines. Agrimotors, freight automobiles, crude oil engines and every kind of machine that will be useful in the development of the colony will be displayed.

Municipal Motors in Glasgow—The city of Glasgow, Scotland, which has already installed motor fire vehicles, motor prison truck and automobiles for the conveyance of the various officials of the city, has placed an order for a motor driven street sweeping machine, which will be put into service immediately.

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THE A B C OF MOTOR CAR OPERATION.

Part III—Outlining the Various Systems Utilized with the Commercial Gasoline Vehicle, Their Components and Application in Practise—Defining Conductors of Electricity and Explaining the Theory of Induction.

By C. P. Shattuck.

TO OBTAIN efficiency as well as to eliminate opportunities of trouble, a knowledge of conductors and insulators of electricity is essential. This is particularly true of the high-tension current which displays a wonderful avidity for returning to the "ground," or home, because of its extremely high voltage or pressure, a condition brought about by the induction coil, the construction and operation of which will be explained in logical sequence.

Conductors of electricity may be compared to a pipe conveying water from one vessel to another, the fluid representing the electricity and the pipe the insulator. When there is but little head or pressure of water the walls of the pipe may be constructed of thin material, but if the fluid is forced or pumped at a great pressure, the thickness of the tubing must be increased, else the pipe will burst and the water escape.

The primary or low-tension current, such as derived from dry cells or a storage battery, is similar to

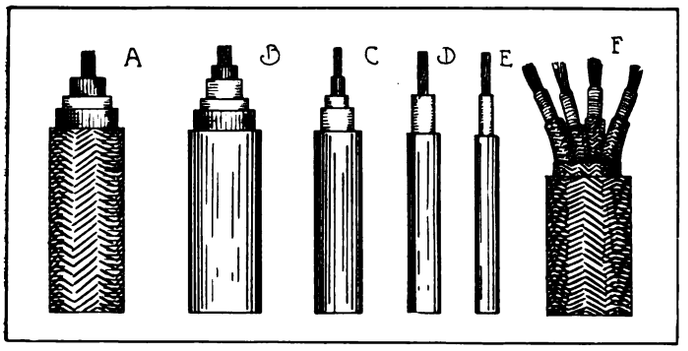


Fig. 10—Illustrating Conductors of Electricity Employed for Ignition Purposes: A, B and C, High-Tension Cables; D and E, Primary Wires; F, Four-Strand Low-Tension Cable.

water flowing under slight pressure, while the secondary or high-tension electricity is analogous to the fluid being forced through the tubing. A simple explanation of the action of these currents is obtained by water flowing through a garden hose. If the faucet be opened but slightly the fluid will dribble out of the nozzle, but upon the pressure being augmented considerable strain is brought to bear upon the walls of the hose by the water seeking to escape. When the resistance of the nozzle is greater than the walls of the hose, the latter will burst and the water will leak to the ground.

Electrical Conductors.

Electricity is not conveyed through tubing, but through metal, which is an excellent conductor. All metals will conduct electricity, also well burned charcoal, plumbago, metallic ores, acid solutions, animal fluids, saline solutions, moist earth, water and living vegetable substances. It has been explained that the ohm represents the unit by which the resistance to a current is measured. The conductivity and resistance of different metals vary considerably and the resistance increases with the temperature of the conductor. Next to silver, copper is the best conductor and annealing the metal decreases the resistance as well as renders the wire pliable. Because of the vibration set up by the automobile a single strand wire is not practical and a number of fine wires are employed, these varying from 20 to 42, according to the make of the cable.

Like the water in the hose pipe, the current must be prevented from flowing through other than the predetermined channels and to prevent the loss of electricity the fine strands of wire are covered with a non-conducting material, commonly called insulation. Insulators include dry air, shellac, rubber, glass, paraffin, porcelain, mica, fibre, ebonite, wax, resin, dry leather, oils, parchment and silk.

Insulating Materials.

Rubber is an excellent non-conductor of electricity and with high grade ignition wiring the pure material is utilized, the strands of copper being covered with several layers of rubber. As rubber is affected by heat, oils and moisture, the final layer is covered with a linen braid or other similar material, impregnated with a special compound and heat treated. Some makers coat the outside jacket with a shellac preparation.

Wires utilized to convey primary and secondary currents are distinguished easily by their size, the former being small and varying from an .125 inch to .25 in diameter, while the high-tension cable is from .375 inch to .5 inch. Conventional types are illustrated at Fig. 10, the secondary cables being shown at A, B and C, while the primary wires are indicated at D, E and F.

It will be noted that the large cables are provided with four or five layers of rubber in addition to the cutside jacket, while the primary wires have but one or two coverings of insulating material. The construction is analogous to the garden hose, the high-tension cables being equipped with substantial walls to withstand the pressure of the high voltage current. As the smaller wires convey the low-tension current, or low pressure electricity, it is not necessary that the conductor or copper wires be so heavily insulated.

Function of Terminals.

Before describing the method of converting the primary into a high-tension current for the purpose of igniting the mixture in the cylinder of the internal combustion motor, the terminals or connectors should be considered. It is poor practise to strip a wire or

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cable to expose the metal for the purpose of attaching the lead to the battery or spark plug as not only are the wires likely to break through vibration, but one or more of the strands may come in contact with other metal, creating a short circuit.

For the purpose of making connections between batteries or securing the leads to the coil, magneto or plugs, terminals or clips are employed, and there is a large variety of designs offered as will be noted by the devices illustrated at Fig. 11, which depicts conventional types. Those at B and C are employed for connecting dry cells in series or multiple as previously explained. When wires are led from the battery to the coil and to the frame for "grounding," the terminals shown at G and L are utilized. The insulation is removed from the end of the wire, which is inserted in the small opening and then soldered. This makes a solid connection, eliminating resistance, as well as preventing stray strands from creating short circuits. The short wings of the terminal are first clamped over the bare wire and the long wings bent over the insulated fibre sleeve, which when rotated contracts or expands the jaws as desired. High grade wiring and care in soldering are essential for successful operation of the ignition system.

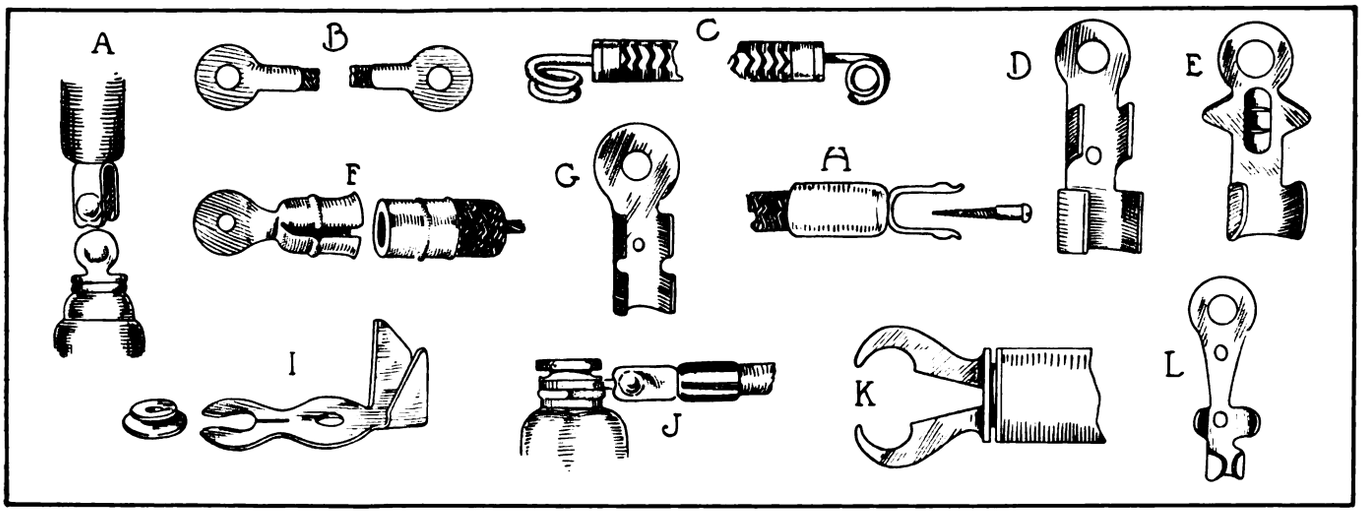


Fig. 11—Presenting Different Types of Terminals: B and C, Battery Connections and Terminals; G and L, Copper Primary Wire Terminals; D and E, Secondary Members; A, F, H, I, J and K, Detachable Types of Secondary Terminals Employed with Spark Plugs.

portion, preventing its working back, which often causes the wire to break off at the terminal.

Types of Terminals.

The terminals shown at D and E are also of copper and are employed with secondary wires where the spark plug is fitted with a knurled nut for retaining the terminal, which is provided with an opening. The clip shown at I is employed in connection with a well known make of spark plug and may be employed with any type of plug as the device includes a small ringed member for service with the knurled nut type of plug. The terminal is fitted with jaws which slip over the ringed member, making it an easy matter to displace it when a spark plug has to be removed for inspection or for cleaning.

Another design is depicted at A, the head of the plug being equipped with a ball member over which the terminal slips. This type is also made with an adapter as shown at J. That at K differs from those described in that the gripping jaws are actuated by a

Necessity of Induction Coil.

Before describing the building up of the low-tension current, it should be explained that the charge of combustible vapor in the cylinder of a motor is exploded by a spark. The flame is produced by the electricity jumping across the gap at the points of the plug and this opening is practically an air space. It has been explained that air is a non-conductor of electricity and consequently resists the current, the amount of resistance depending upon the width of the gap. The gap of the standard spark plug is .03125 inch and is practically a break in the circuit.

If a ring of metal is broken and the ends separated, a gap is obtained. If one end of the metal be touched to the positive terminal of a battery and the other extremity held within .03125 inch of a wire attached to the negative pole, current will not flow unless of sufficient potential. But if the pressure of the current were augmented the electricity would jump across the gap, completing the circuit.

If one wire from a battery be attached to the shell or metal base of a spark plug, and the other lead of the battery secured to the terminal of the plug, current will not flow or bridge the gap because of the air space and low voltage of the battery, but if the pressure be increased to a predetermined amount by means of an induction coil, the current will jump the gap, creating a flame in the operation. This is known as the jump spark and the time of sparking is regulated by a component of the ignition system known as the timer or commutator, which is practically a switch, in that it opens and closes the primary circuit when the mixture in the cylinder is compressed and the piston is in the proper position for the firing stroke.

High-Tension Current.

The transforming of the low-tension or battery current into high-tension is by induction. Magnetism and

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electricity are closely allied and the link between these lies in the fact that magnetic lines of force are constantly passing from the south pole to the north, these

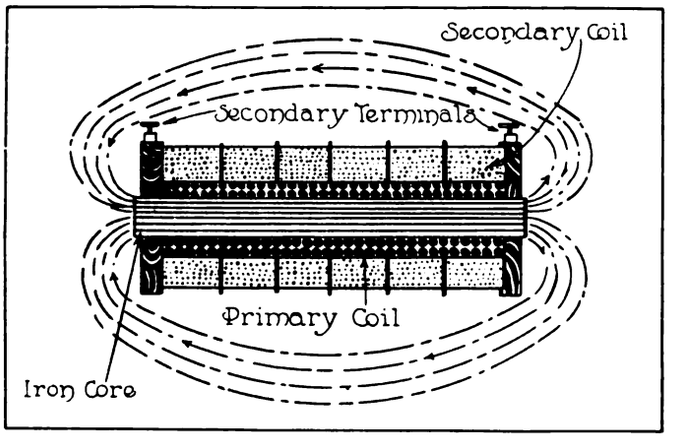


Fig. 12—Sectional View of an Induction Coil, Showing the Lines of Force.

returning to the south pole through the atmosphere, and circular magnetic lines of force surround a conductor through which an electric current is flowing. The space in which the magnetic lines of force are active is called the magnetic field.

Theory of Induction.

If a length of insulated wire be wound into a coil and a current passed through it, the magnetic lines of force which surround the wire will travel in one general direction on the inside of the coil and in the opposite direction on the outside, as illustrated at Fig. 12. If two coils of insulated wire be placed in proximity to each other, one inside the other, and the ends of inside coil connected with a source of electricity, the current passing through that coil will induce electricity to flow through the second coil, the intensity of which is the greatest when the circuit of the first is quickly broken. When the first coil is converted into an electro-magnet by placing within it a core of soft iron the strength of the current is further augmented, depending upon the number of turns in the respective coils. The coil through which the current passes positively is composed of coarse wire and is called the primary, while that in which it is induced is known as the secondary.

At Fig. 13 is presented a simple demonstration of the induced current. It will be noted that the leads from the dry cells are connected to a primary coil comprising coils of coarse wire wound around a soft iron core and so constructed that it may be inserted and removed from the secondary coil, which is composed of a number of fine wires as previously explained. The ends or leads from the secondary circuit are connected to a current indicator.

Flow of Current.

When the primary coil or core is inserted, the current flows in one direction, and when withdrawn it flows in the opposite direction. This production of current is shown by the movement of the indicating needle of the measuring instrument. The intensity of the current is not only dependent upon the number of turns of wire, but upon the rapidity with which the core member is inserted and withdrawn from the secondary coil. It would not be practical, however, to utilize such an arrangement for igniting the explosive vapor in the cylinder of the gasoline motor, and instead the coil is provided with a vibrator operated by the magnetism of the core, which interrupts the primary current. This making and breaking of the primary circuit is productive of a very high electromotive force in the secondary winding, which is necessary to force the current to bridge the gap at the plug.

Why High Voltage Is Required.

It requires about 10,000 volts to force an electric current to cross an air gap of .0625 inch and as the spark coils utilized in connection with ignition systems for motor car service are capable of jumping a spark across a space of from .375 to .75 inch, it is obvious that they must be productive of electrical pressures of from 50,000 to 100,000 volts. This voltage is secured from dry cells or a storage battery registering approximately six volts. Although the voltage appears extremely high it must be remembered that the amperage is proportionately low and that a small amount is lost in the coil.

(To Be Continued.)

Ed. Note—The next installment will deal with the components of the induction coil, explaining the construction and operation of the condenser, also outlining the different types of timers and distributors of the high-tension current.

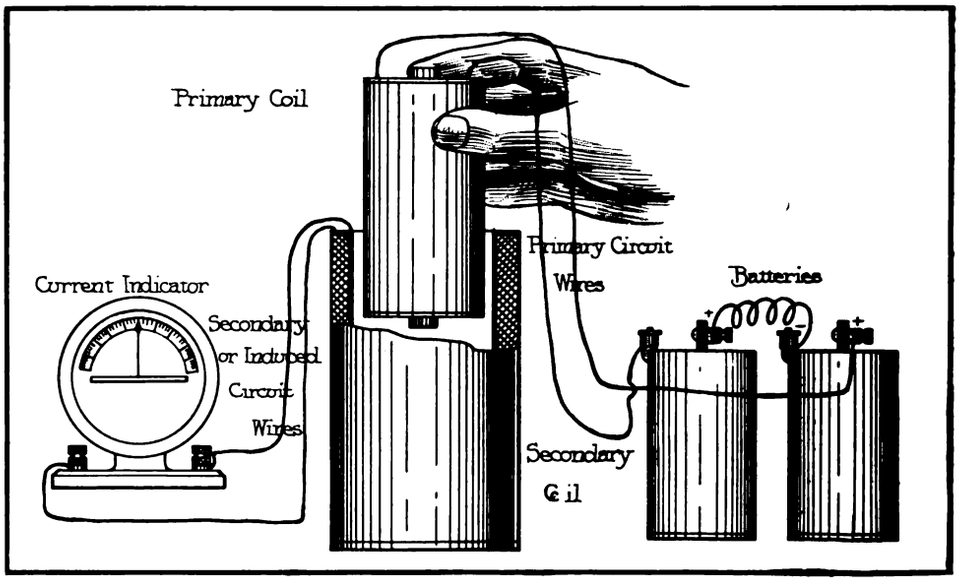


Fig. 13—Illustrating the Principles of an Induction Coil, Showing the Primary and Secondary Sources of Current and Measuring Instrument to Indicate When Induction Takes Place.

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New Commercial Car Accessories

Rexo Electric Horn.

To meet the demand for a low priced, high grade electric horn, the Dean Electric Company, Elyria, O., has brought out a new type called the Rexo. It is operated by any six-volt battery and the same material and workmanship are employed as with the other types made by the company. It is economical of current, requiring less than 1.8 amperes and the maker points out that it does not require adjustment or attention after being assembled at the factory. It gives a clear, penetrating signal, operated by the pushing of a button conveniently located.

Gemco Emergency Grip.

The Garage Equipment Manufacturing Company, Milwaukee, Wis., is marketing an emergency grip device for truck tires. It is designed to be employed separately from others of the set and may be placed at any point on the wheel between the spokes, and as many may be utilized as convenient. The chain is held over the tread by the two side bars, which are clamped together by means of a bolt located under the felloe.

Baldwin Chains.

Chains are an important factor in the economical operation of commercial vehicles, and as these members are exposed to the elements and subjected to heavy stresses it is important that they be constructed of high grade material and accurately designed. The Baldwin Chain & Manufacturing Company, Worcester, Mass., produces a large variety of chains for all types of motor cars and the product of this concern is well and favorably known among truck builders. The company also manufactures light chains for driving magnetos, pumps, etc.

Holt & Beebee Electric Tail Light.

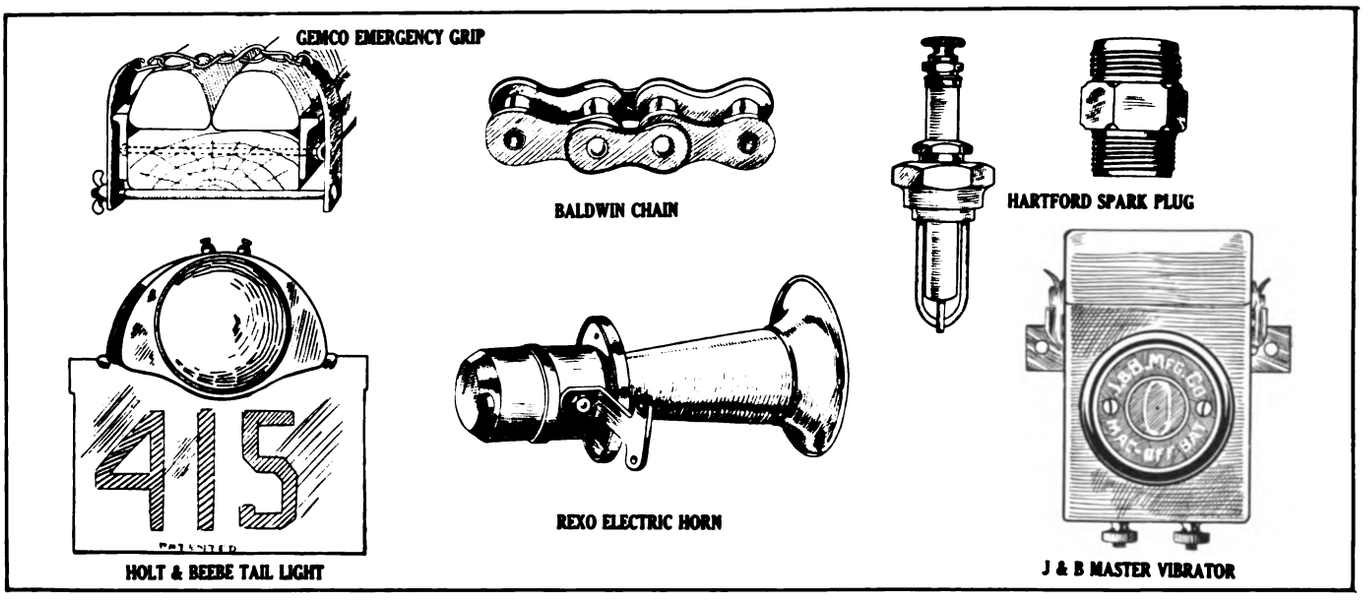
Electric tail lights are favored on commercial cars of the delivery type as they add to the appearance of the vehicle. Holt & Beebee, Boston, is manufacturing a high grade electric tail light which not only serves as a rear signal, but illuminates the license tag. The red semaphore is mounted above the number upon which is thrown a white light. The light is operated by a six-volt battery, is sturdily constructed and inexpensive.

Hartford Spark Plug.

The Hartford Suspension Company, Jersey City, N. J., is marketing a two-piece spark plug, a design making for easy cleaning qualities. Its lower part is screwed into the cylinder head while the upper portion is removable. The plug is simple in design, and the parts so constructed that they may be separated easily. It is gas tight and the company points out that it cannot rust or freeze. It is constructed of high grade material and is moderately priced.

J. & B. Master Vibrator.

Among the qualities of a master vibrator is that it synchronizes the spark when a high-tension coil and batteries are employed. The J. & B. Manufacturing Company, Pittsfield, Mass., well known maker of ignition specialties, has brought out a master vibrator for service where more than one unit is employed. It is constructed of high grade material and the contact points are fitted with 25 per cent. iridium, making for durability. The master vibrator is neat and compact.



Illustrating Accessories Applicable to the Commercial Vehicle, Including Rexo Electric Horn, J. & B. Master Vibrator, Gemco Emergency Grip and Hartford Spark Plug.

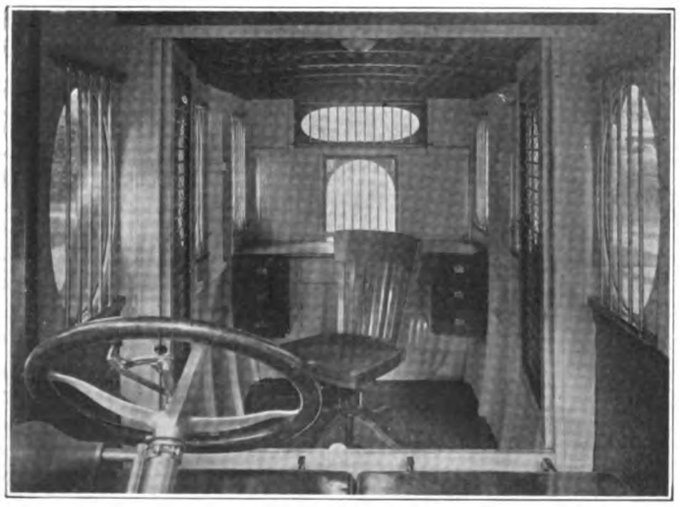
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CARTERCAR BANK ON WHEELS.

Specially Constructed Vehicle Which Protects City's Cash from Hold-Up Men.

Until recently, the Detroit city payrolls were distributed by policemen on foot, but strange as it may seem, several of these guardians of the law and the city's cash, were held up on their rounds, and the city treasurer was convinced of the necessity of providing some means whereby this danger could be avoided. As a result of the excellent service obtained by the police department of Detroit with friction driven Cartercars, made by the Cartercar Company, Pontiac, Mich., this concern was given charge of the problem.



Interior of Cartercar, Equipped for City Paymaster in Detroit.

Herewith is presented an interior view of the car produced by the Cartercar Company to conform to the ideas conveyed by the city treasurer of Detroit. The chassis is the regulation Cartercar standard model, but the body construction is of particular interest. It will be noted that the interior presents an appearance not unlike a bank on wheels, and it is maintained that the city's funds are quite as safe therein as in the vaults of a bank.

Every modern convenience is incorporated, so that the paymaster practically transfers his office from the city hall to the Cartercar for the time being. This little office is securely locked, and steel bars protect the windows and doors. Even were it possible for the thief to overpower the driver, the paymaster would still be able to defend himself and the cash.

MOTOR PUMPING ENGINES.

Expert Says They Need Excess Capacity and That Manufacturers Aim at Perfection.

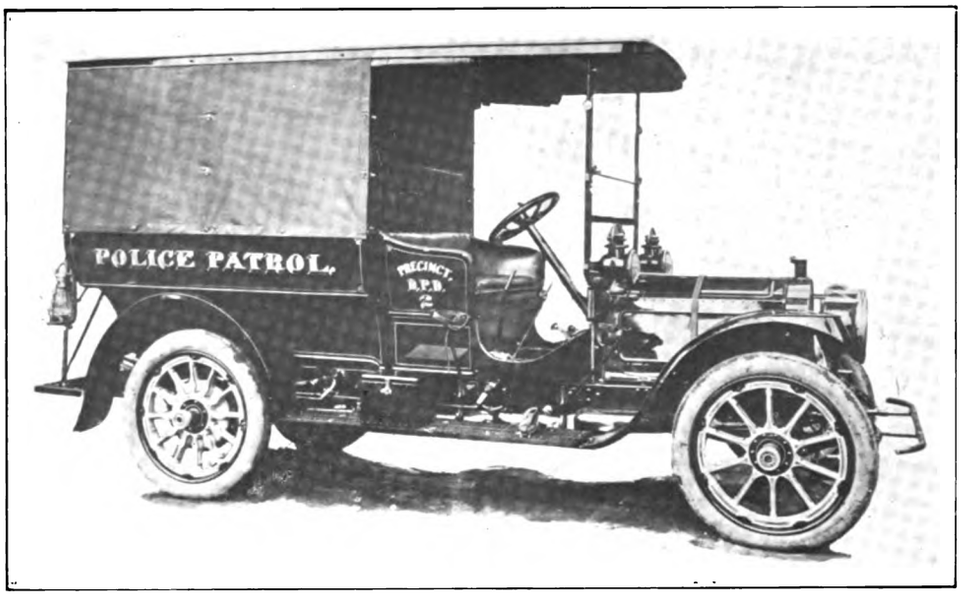
At the recent convention of the International Association of Fire Engineers at Denver, Col., Chief Engineer George W. Booth of National Board of Fire Underwriters, delivered an interesting address on "The Efficiency of the Motor Pumping Engine," in which he made many comparisons between that type and the steam fire engine it is gradually displacing. Mr. Booth said in part:

"The automobile fire engine is in many ways a more complicated piece of machinery than the steam fire engine and because of this and the inability to get highly trained men to care for and operate them their efficiency is liable to fall off considerably in actual service. As a consequence a certain amount of excess capacity is required, both in the pump and the engine, to offset this liability and provide sufficient power under all conditions.

"There is a growing tendency among manufacturers of automobile fire engines toward these high-powered motors, since they decrease the liability of heating or other engine troubles and of vibration and consequent loosening or breaking of small parts. In making a comparison between the motor pumping engine and the steam fire engine there is one feature on which we have not yet sufficient data to base definite conclusions; namely, the ability to operate efficiently and without serious interruption at fires extending over long periods and especially under adverse weather conditions. It is not intended to argue that automobile pumping engines may not have this ability, but simply they have not proved it as have steam fire engines; we believe they will be developed to possess this ability if they do not possess it already.

"In designing any new type of apparatus it is of course to be expected there will be certain features susceptible to improvement; some of these have already been discovered and corrected and the desire and intention of manufacturers to perfect their products is encouraging. Automobile fire apparatus does not re-

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Patrol Wagon Fitted to 30 Horsepower Packard Chassis for Use by the Police Department in Detroit.

ceive as constant service as commercial apparatus, but its use is generally more severe; considering everything, we see no reason why it cannot be constructed to have a life almost as great as the steam fire engine and to maintain an equal efficiency."

INTERESTING POLICE PATROL.

Motor Truck Body Company of Detroit Provides New Type for Use in That City.

The business of producing special bodies for motor driven chassis has developed within recent months along lines which present opportunity for an industry in every way akin to that of manufacturing automobiles, although somewhat separated therefrom. One of these concerns, composed of men who have long experience in the production of bodies of all types, is the Motor Truck Body Company of Detroit. It will be conceded, perhaps, that there is more demand for special bodies in certain kinds of commercial haulage, but it is interesting to note that this company also has turned its attention to municipal service work, and with decided success.

An accompanying illustration presents a police patrol wagon fitted to a 30 horsepower Packard chassis in service with the city of Detroit, the body being the work of the Motor Truck Body Company. It is of the enclosed type, and is so built as to provide seats for a driver and one man entirely separate from the main portion, which has accommodations for eight or more persons. In addition, provision is made for carrying an ambulance stretcher, so that the vehicle answers all the requirements of police work.

The main portion of the body is enclosed with heavy wire screens, securely fastened, and with an opening at rear of sufficient size for easy passage. In addition to the screens, the sides and rear are fitted with rolling curtains of water proof material, which effectually protect the occupants from public view.

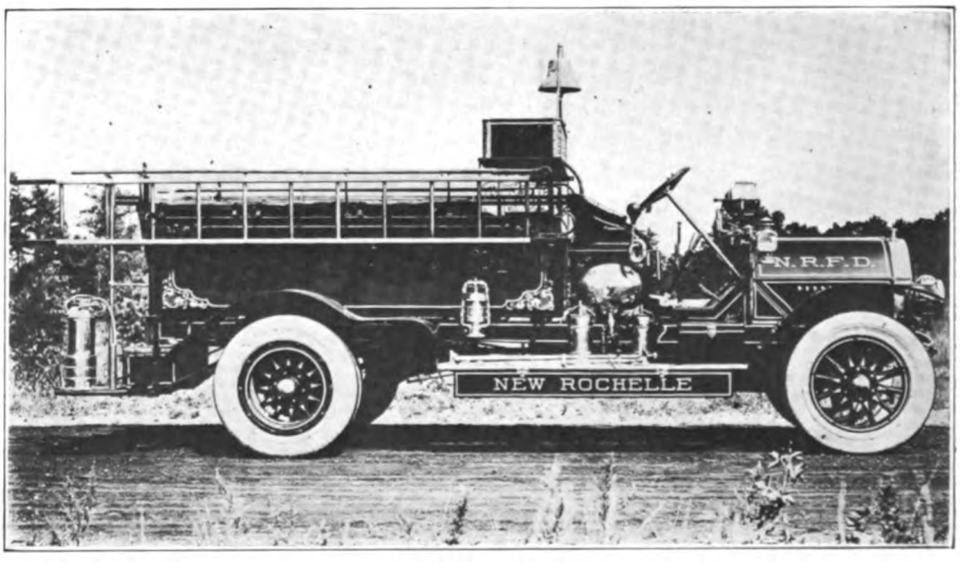
The rear entrance is furnished with hand rails of polished brass. The seat cushions are fabricated of the highest quality of hand buffed leather. An electric light, protected by a heavy glass globe and connected to a suitable storage battery, is supported on the inside of the roof.

The driver is thoroughly protected from weather conditions by side curtains, and an adjustable windshield, the latter being constructed in such manner that a full view of the road may be obtained during rain or snow. In every respect the workmanship and material is of the very best quality throughout.

KNOX FOR NEW ROCHELLE.

City Decides to Bring About Complete Motorization of Department in Near Future.

The city of New Rochelle, N. Y., has just purchased and put into service two pieces of motor fire apparatus, made by the Knox Automobile Company, Spring-



Knox Combination Chemical Engine and Hose Wagon, Recently Installed in New Rochelle, N. Y.

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field, Mass. One of these is shown herewith, being a combination chemical engine and hose wagon, while the other is a so-called flying squadron car.

The combination machine is equipped with one 40-gallon chemical tank located under the driver's seat and a type C body, having capacity of 1200 feet of 2.5-inch water hose, as well as a crew of 10 men. The body is arranged with lockers along each side, in which the men carry their special fire clothing, enabling them to change their clothes while on the way to the scene of the blaze. The remainder of the equipment consists of baskets for chemical hose, hand extinguishers, ladders, fire bell, siren horn, searchlight on the dash and a full complement of special fire tools.

The chassis is known as the model R-33, and is fitted with a 40 horsepower, four-cylinder motor, special heavy three-speed transmission and chain drive to the rear axle. Official tests, before the machine was placed in service, indicated that the machine is possessed of excellent speed possibilities and is a powerful hill climber.

The flying squadron car will carry 10 or 12 men, and is to be used in connection with the police department, to rush men to fires for keeping back the crowds and assisting the firemen in their work. It carries one hand extinguisher and a few special fire tools.

The installation of these two wagons, which comprise the first motor driven apparatus of the department, marks the determination of the city to put the entire fire fighting equipment on a motor basis within the near future.

R-C-H FOR BATTALION CHIEFS.

New York City Decides to Put Three Cars of This Make in Service After Tests.

Three R-C-H cars are the latest purchase of the New York fire department, a contract having been placed with the New York branch of the R-C-H Corporation, Detroit. The model chosen is the new long wheelbase, two-passenger roadster, the vehicles being intended for the use of the battalion chiefs.

Before the selection was made, the R-C-H was put to exhaustive tests under all conditions by the fire authorities. In traffic it showed its ability to travel at a speed of four or five miles an hour on the high gear and pick up again to the maximum. The choice of the R-C-H car is a fine testimonial of the Detroit vehicle, which is a new model introduced about a month ago and which has achieved widespread attention.

PIERCE-ARROW FORESTRY WAGON.

Park Department in Buffalo, N. Y., Solves the Problem of Transplanting Trees.

Perhaps it is due in a measure to the widespread discussion of the subject of conservation, but whatever the reason, it is certain that the people in the cities are beginning to appreciate more and more the value of growing trees, and whenever it becomes necessary to remove a handsome tree, now-a-days, some step usually is taken to transplant it in another location. The result has been the establishment of a forestry division within the park department.



Five-Ton, Worm Driven Pierce-Arrow Truck in Service with the Forestry Division of the Park Department in Buffalo, N. Y., for Transporting and Transplanting Trees.

There are several problems connected with this work, and none the least of these is the method to be employed in transporting the tree with its roots, branches and leaves, from one point to another. The park department in Buffalo, N. Y., has solved this by the utilization of the five-ton, worm driven Pierce-Arrow truck, made by the Pierce-Arrow Motor Car Company of that city, which is shown in an accompanying illustration.

It will be noted that the load this truck is called upon to handle is bulky, rather than heavy, and for this reason a truck of long wheelbase was selected. The body is of the platform and stake type, 16 feet six inches wide, and the wheelbase is 17 feet. When not

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employed in transporting living trees, it is utilized in carrying supplies from one part of the city to another in the ordinary work of the park department.

GOODYEAR TIRES ARE SATISFACTORY.

Akron Official Reports That One Set Ran for Three Years on Webb Pumping Engine.

Several fire department chiefs have testified to the satisfactory service they have received from Goodyear tires, made by the Goodyear Tire & Rubber Company, Akron, O., which have been tried out on fire apparatus under varying conditions. Among them is Chief John T. Mertz of the Akron fire department, who says:

"We have a Webb combination pumping engine, chemical and hose wagon weighing 8500 pounds fully loaded, equipped with Goodyear no-rim-cut, non-skid tires, that have been in service nearly three years and on which the tires have not been changed since the machine was placed in service until last week when one of them became cut and torn. As a result of the service received of your tires we have specified them as equipment on a new Webb engine and hose wagon recently ordered."

SEEKS MOTOR EQUIPMENT.

Melrose Mayor Says New Apparatus Must Come and Asks for Immediate Motorization.

That motor apparatus is not only more efficient than horse drawn vehicles, but more economical for a city is the opinion of Mayor Charles E. French of Melrose, Mass., who recommends to the city government an immediate change to the motor type. Mayor French desires $17,000 for installing an engine, ladder truck, combination chemical and runabout for the chief of the department. This recommendation follows the purchase of motor fire vehicles two years ago.

In support of his recommendation Mayor French points out that the annual cost of the food and care of the horses of the fire department exceeds $2000. The issue of $17,000 in bonds, payable $2000 a year, would not increase the cost of the apparatus to the city and would provide it with the latest type of machinery which will have to be purchased in any event even were horses retained.

WHITE AMBULANCE FOR ATLANTA.

Special Attention Has Been Paid to Matters of Comfort and Convenience in Its Construction.

A private automobile ambulance, designed for hospital work in the city of Atlanta, Ga., has just been delivered to the Barclay & Brandon Company by the White Company, Cleveland, O., maker of White pleasure and commercial cars. The vehicle is of the enclosed limousine type, measuring fully 16 feet in length, splendidly finished in bronze and striking in appearance because of its very unusual size. The doors bear a heavy gold monogram "B. & B." and on the side panel is the inscription "Private Ambulance."

The machine is fitted to a heavy chassis, with 30 horsepower engine and wheels equipped with extra heavy tires, making for easy riding qualities. It is literally a hospital on wheels, containing every known comfort and convenience a patient could obtain at the best hospitals. The interior measures five feet wide by 10 feet long.

Included in the furnishings are: Spring cot and mattress, two leather upholstered chairs, lavatory with hot and cold water, ice water cooler, electric fan and electric lights which can furnish bright or subdued illuminations, medicine chest and equipment. Pipes from the automobile radiator heat the vehicle in winter and the Barclay & Brandon Company is certain the machine cannot be duplicated in this country. The White Company took six months to construct it.

BRIEF ITEMS OF GENERAL INTEREST.

Pope Ambulance a Saver—No less than three ambulance teams of two horses each have been displaced in San Francisco's emergency hospital service by the introduction of one motor ambulance. This is the report given to the Consolidated Motor Car Company, San Francisco, distributor for the Pope-Hartford machines, made by the Pope Manufacturing Company, Hartford, Conn., which furnished the ambulance after it had been given a thorough test in the city's service. The emergency hospital men say that the motor has proved itself more efficient in every way than the horse drawn vehicles and it seems probable that all of the city's hospitals will be so equipped.

Texas City Secures Ambulance—The automobile ambulance owned by F. P. Malloy & Son, Galveston, Tex., has been engaged by the city authorities to answer all emergency calls within the corporation limits. It has made itself a conspicuous part of the city life since its installation and has been of inestimable value in the transfer of the wounded and ill to the hospitals.

Police Ambulance in Beverly—Mayor Frederick A. Dodge of Beverly, Mass., has signed an order calling for $3500 for a new motor ambulance for the police department. The ambulance will be ordered soon and will be placed in service as soon as received.

First in New Haven—Beecher & Bennett, an undertaking firm in New Haven, Conn., expects to have in service in a short time the new motor van which it ordered several weeks ago. The specially designed commercial body, which will be mounted on a White 1500-pound chassis, made by the White Company, Cleveland, O., is nearing completion and the firm will have the distinction of having the first power vehicle purchased by an undertaking firm in New Haven.

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RECENT MOTOR VEHICLE PATENTS

Morgan Grease Cup Device.

Nels Morgan, Funk, Neb., has been granted a patent for a cap securing device for a grease cup. The latter is provided with a recess in which is fitted the end of a shouldered stem of a spring. The latter is secured to the base of the cup proper and the tension of the spring prevents rotation of the cap and its possible loss.

Rhett Safety Motor Starting Device.

A safety motor starting device of the mechanical type has been patented by James M. Rhett, Beaufort, S. C. It comprises, in addition to the usual crankshaft of the engine, a second shaft to which is secured a ratchet wheel. A lever is provided with a pawl, pivotally mounted, and the pawl engages with the ratchet wheel and has an edge extending beyond a similar projection on the lever. Loosely mounted upon the second shaft is a disc provided with abutments, the lever and the outer end of the pawl being arranged between said abutments, and a spring tending to press the pawl into engagement with the ratchet wheel.

Daimler Clutch Actuating Mechanism.

Paul Daimler, Unterturkheim, Stuttgart, Germany, assignor to Daimler Motoren-Gesellschaft, has been granted a patent for a clutch actuating mechanism comprising a double cone friction clutch having two cones slidably movable in opposite directions on one shaft and to be coupled under the action of a spring. Friction surfaces are carried by the other shaft to be coupled, and there are concentrically and laterally projecting hubs on said cones. An abutment is provided on the hubs, with a wedge between abutments. Means are provided for engaging and disengaging the cones from the friction surfaces.

Clapp Convertible Wheel Tread.

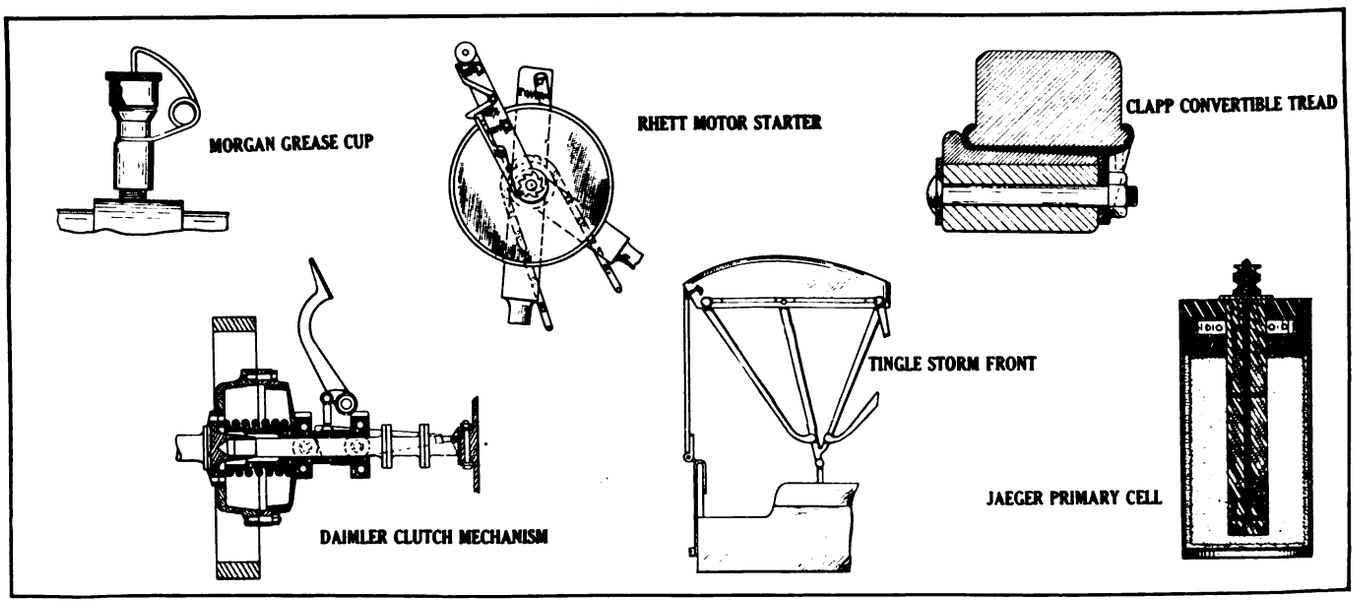
Harold W. Clapp, Berkeley, and Blanchard Collins Edgar, San Francisco, Cal., have been granted a patent for a convertible tread wheel. It comprises a felloe having a side flange whereby it may be adapted for rail service, also a second tire for road work. The latter shoe is superimposed on the rail tire, and integral separated lugs are employed for securing the retaining ring.

Jaeger Primary Cell.

Carl and Bertha Jaeger, Los Angeles, Cal., have patented a primary cell of the dry type which is so constructed that the electrolyte may be stimulated or renewed. The carbon post is provided with a longitudinal passage and leading from it are lateral passages connecting with the surface of the carbon element.

Tingle Storm Front.

George W. Tingle, Chatham, Mass., has patented a storm front for vehicles, which differs from those of usual construction in that the side curtains may be secured to it, completely enclosing the driver. The front is in two hinged sections, the lower being clamped to the dash while the upper is retained in position by hooks locking in eyes in the top proper.



Illustrating Some of the More Recent Ideas of Inventors of Devices Applicable to the Commercial Vehicle, Including Motor Starter, Primary Cell, Storm Front, Etc.

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BRIEF NEWS OF MANUFACTURER AND THE TRADE

The Crescent Motor Truck Company, Middletown, O., in preparation for the coming season has increased its capital stock to $100,000.

The Missouri Taxicab Company, St. Louis, Mo., has purchased land on Euclid avenue upon which it will erect a garage building to cost $25,000.

The Pioneer Commercial Auto Company, Los Angeles, Cal., has been formed by C. M. Turner, Agnes N. Fuller and John C. Stick with capital of $200,000.

The Universal Motor Truck & Traction Company, Trenton, Ill., is to move its plant to Collinsville, Ill., the latter city having made attractive inducements.

The Mason-Seaman Transportation Company, New York City, has opened a taxicab station at 712 Pacific street, Brooklyn, for the convenience of Brooklyn people.

The Ideal Auto Company, Ft. Wayne, Ind., manufacturer of Ideal motor wagons, has built a substantial addition to its plant, enabling it to produce one machine daily.

The Oklahoma Motor Truck Company, Tulsa, Okla., manufacturer of commercial motor trucks, has started a new factory on Boulder street. P. A. Haworth is president of the firm.

The Stewart Iron Company, Covington, Ky., is erecting a motor wagon factory in connection with its other plant and will shortly call for bids for the machinery to be installed.

Barlow Garage Company, Newark, N. J., recently organized to maintain and repair pleasure and commercial vehicles at 233 High street, will open new quarters at 133-135 Washington street.

The Garford Motor Company, Newark, N. J., distributor of Garford trucks, has purchased a site at Central avenue and Hudson street, upon which a two-story brick garage will be erected.

The Stegeman Motor Car Company, Milwaukee, Wis., maker of Stegeman trucks, has occupied its new plant at 606 Linus street. The capacity of the plant has been increased to 500 vehicles a year.

The Westcott Motor Car Company, Little Rock, Ark., has taken the agency in that territory for the Pierce-Arrow trucks and pleasure cars, made by the Pierce-Arrow Motor Car Company, Buffalo, N. Y.

The D. F. Poyer Company, Menominee, Mich., has been incorporated with a capital of $75,000 to manufacture commercial motor vehicles. The directors are D. F. Poyer, H. T. Emerson and Fabian Trudell.

The St. Louis Motor Transportation Company has been organized at Belleville, Mo., with a capital stock of $25,000 to contract for motor truck hauling in St. Louis. William and Frank Bush are stockholders.

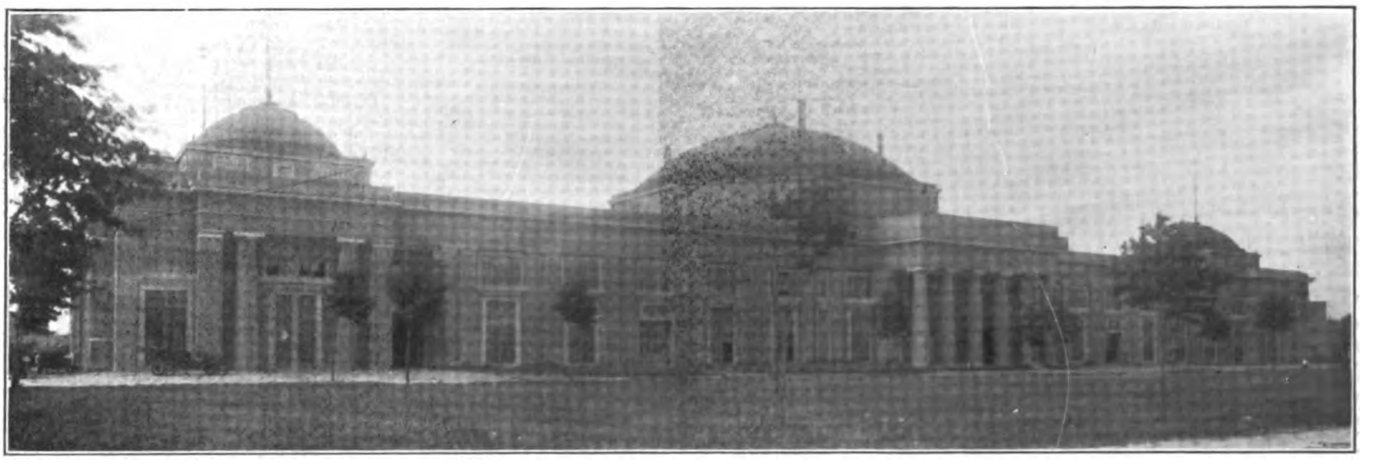
The Pierce-Arrow Motor Car Company, Buffalo, N. Y., has given a contract for the erection of three additional stories to its truck assembling building and one story to each wing of its three-story body building.

J. W. Cully, formerly a salesman at the New York branch of the Swinehart Tire & Rubber Company, Akron, O., maker of Swinehart tires, has been promoted to become manager of the Detroit branch of the company.

The Ramsey Electric Company, Detroit, Mich., has just occupied its newly erected building to be used exclusively by electric vehicles of all kinds. The garage is located on Grand boulevard and is of brick and concrete.

The Hurlburt Motor Truck Company, New York City, has been incorporated for the manufacture of motor commercial vehicles. The incorporators are W. B. Hurlburt, Joseph P. Carroll, William B. Carswell and F. D. Peale.

The St. Joseph Schwartz Company, Ltd., 544 Baronne street, New Orleans, La., has taken the agency for Adams trucks, made by the Adams Bros. Company, Findlay, O., in the states of Louisiana, Mississippi and southern Alabama.



Handsome Structure Which Will Be Occupied by the Kelly-Springfield Motor Truck Company as Headquarters for Its Boston Branch.

The Rockford Motor Truck Company, Rockford, Ill., is a new concern capitalized at $10,000, for the purpose of manufacturing and selling electric and gasoline motors. The directors are P. A. Peterson, Levin Faust and John Ledin.

The Olmstead Traction Engine Company, Great Falls, Mont., has been organized for the manufacture of traction engines and motor trucks and is planning to erect two buildings. It is expected the plant will be in operation by Jan. 1.

A. T. Carbahan, veteran tire salesman of the Swinehart Tire & Rubber Company, Akron, O., has been appointed district manager in charge of Ohio, West Virginia, Kentucky, western New York, western Pennsylvania and eastern Michigan.

The L. A. W. Motor Truck Company, Wilmington, Del., has been formed with capital stock of $200,000 for the manufacture and sale of motor wagons. The members of the concern are G. G. Rhinley, Clifford V. Mannering and C. R. Ridge.

The Kelly-Springfield Motor Truck Company, Springfield, O., maker of the Kelly line, has taken possession of its new Boston headquarters, an illustration of which is presented herewith. Every facility is afforded for caring for trucks in service with purchasers in Boston and vicinity, and the branch is expected to prove one of the best equipped in this respect in the East.

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The W. E. Bush Company, Los Angeles, Cal., has secured L. R. Wadsworth as sales manager and he has charge of the distribution of Pierce-Arrow pleasure cars and trucks, made by the Pierce-Arrow Motor Car Company, Buffalo, N. Y.

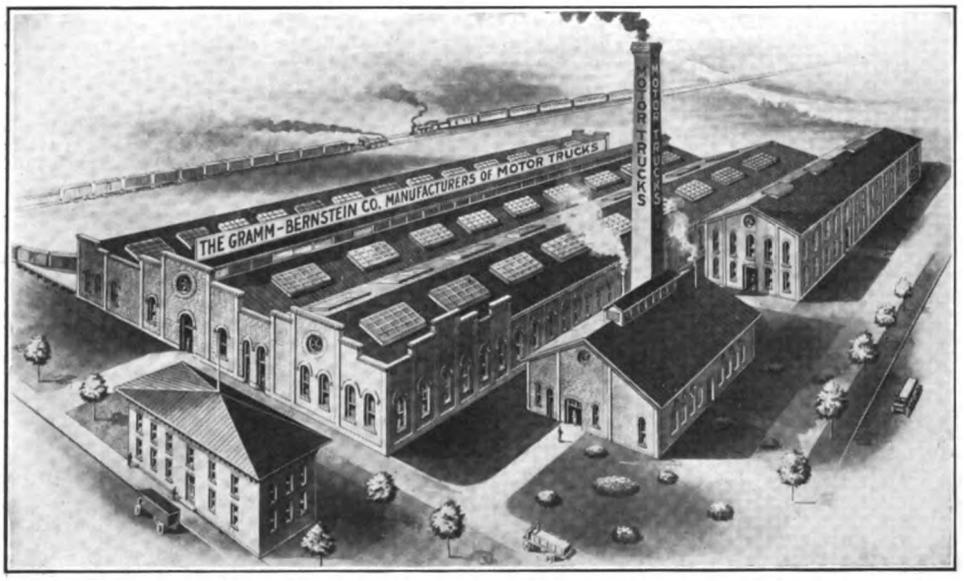
Thomas Walker and Supt. Weiss and other associates have purchased the Flint Axle Works, Flint, Mich., and the firm name will be changed to the Walker-Weiss Axle Works. The manufacturing facilities of the plant will be greatly enlarged.

The Drednot Motor Truck Company, Montreal, Can., is a new concern formed to manufacture commercial vehicles. The capital is $50,000 and the promoters include W. L. Haskell, H. D. Rose, John S. Rigby, V. S. Rose, L. C. Haskell, J. E. Merritt and D. S. Whittall.

T. P. Myers of Detroit has assumed his duties as general manager of the General Motors Truck Company's New York City branch. Mr. Myers is one of the pioneers of the industry, having entered the field when motor trucks were first making their appearance.

The Continental Motors Corporation, Buffalo, N. Y., has been formed for the manufacture of gasoline engines. The capital stock is $100,000 and the directors are Gordon F. Matthews, Frank V. Wayland, Allen E. Choate, Walter Schmieding and Reverdy L. Hurd.

The Brown Commercial Car Company, formed about three months ago by Will H. Brown, former president of the Mais Motor Truck Company, Indianapolis, maker of Mais trucks, has purchased the plant of the Otis Elevator Company in Peru, Ind. The company plans to build 500 Brown trucks the first year.



New Factory Buildings of the Gramm-Bernstein Company, Lima, O.

Frank P. Wilcox, Boston, distributor of the Lippard-Stewart light delivery wagon and the Schacht truck lines, has opened offices at 34 Merchants Row, in the heart of the trucking district. He has also established a large service station for the maintenance of the vehicles he will distribute.

The J. T. Handt Tractor Company, Waterloo, Ia., recently organized, has purchased the plant of the Star Foundry Company and will begin active operations soon. The officers of the company are: President, John T. Handt; vice president, C. C. Butler; secretary, H. J. Wilson.

H. A. Seller, California distributor of Mack and Saurer trucks, has erected at San Francisco what is said to be the largest building devoted to the exclusive sale and care of motor trucks west of Chicago. It is of reinforced concrete, has a depth of 120 feet, a width of 36 feet and is two stories high.

The Cleveland-Gallon Motor Truck Company is planning an increase in its capital stock, a meeting the early part of November being called for the stockholders to vote on the proposition. It is proposed to increase from $300,000 to $1,000,000, the new stock to be $500,000 7 per cent cumulative preferred and $200,000 common.

The Stewart Motor Corporation, Buffalo, N. Y., maker of Stewart light delivery wagons, has appointed two new district managers. E. E. Dennison has been named for Illinois, eastern Iowa and Missouri, with headquarters at Chicago, and W. T. Butler for New York State and northern Pennsylvania, with headquarters at Buffalo, N. Y.

The Power Truck Sales Company, with main offices at Worcester, Mass., of which Ralph Morgan, formerly with the Morgan Truck Company of the same city, maker of Morgan trucks, is the head, has contracted for the sale of Adams trucks, made by Adams Bros. Company, Findlay, O., in the states of Maine, Vermont and New Hampshire.

Charles E. Riess & Co., New York City, eastern agent of the American-Marion cars, has taken the agency for the Stegeman truck, made by the Stegeman Motor Car Company, Milwaukee, Wis. Albert Englehardt, lately with the Universal Truck Company of New York City, has resigned to assume the management of the truck department.

The Kanawha Auto Truck Company, Charleston, W. Va., has changed its name and will in future be known as the Elk Motor Truck Company. The officers of the concern are: President, S. A. Moore; vice president, W. S. Roberts; secretary and treasurer, J. L. Sydenstricker; general manager, Karl Probst, formerly of the Peerless and Lozier companies.

The Star Carburetor Company, 685 East Atwater street, Detroit, maker of Star carburetors, will be known in the future as the Star Foundry & Machine Company. The plant has been extended so that the making of carburetors has become a small part of the work done. Another new building will be added at once to take care of the rapidly increasing business.

The Grand Rapids Motor Truck Company, Grand Rapids, Mich., has closed a contract with Albert Neigo of Paris, France, for 40 Decatur Hoosier Limited trucks, the deliveries to extend over a year. Mr. Neigo conducts a large importing house at Paris with branches at London and Brussels and was in this country for some time investigating the motor truck situation.

The Ware Motor Vehicle Company, Minneapolis, Minn., has been formed for the manufacture of four-wheel drive motor trucks and it is expected the first machine will be ready for shipment by Jan. 1. The concern has purchased a site for a substantial factory. L. E. Roberts is president and J. L. Ware, chief engineer. The capitalization is $400,000.

The Gramm-Bernstein Company, Lima, O., has practically completed its new factory, which is expected to prove one of the largest plants in the country erected for the exclusive manufacture of motor trucks. With the exception of one building, all are of one story, from 50 to 63 feet wide, and running a total distance of 316 feet in length. No posts are to be found in any part of the plant, which is located along the main lines of two railroads, affording excellent manufacturing and shipping facilities.

The Federal Motor Truck Company, Detroit, maker of Federal trucks, has appointed new agents as follows: Federal Truck Company, St. Louis, Mo.; L. S. Mitchell Auto Company, Chattanooga, Tenn.; Wesley Hill Garage, Phoenix, Ariz.; Vancouver Isle Motor Company, Victoria, Vancouver Isle, B. C.; Barrett Bros., Albany, Ore.; P. J. Weisel & Co., Anaheim, Cal.; H. W. Davis, Auburn, Cal.; B. M. Barker, Austin, Tex.; B. L. Brundage, Bakersfield, Cal.; C. E. Whitten, Boston; U. LaFrance, Central Village, Conn.; Cincinnati Motor Car Company, Cincinnati, O.; Connellsville Garage, Connellsville, Penn.; Alamo Automobile Company, Dallas, Tex.; W. W. Barnett, Denver, Col.; Thompson Auto Company, Detroit; George C. Foster & Co., Evanston, Ill.; J. S. Airheart, Eugene, Ore.; Robert W. Powers, Fall River, Mass.; Fitchburg Hardware Company, Fitchburg, Penn.; M. N. Plumadore, Ft. Wayne, Ind.; C. W. Hobson Company, Fresno county, Cal.; D. W. Brodback, Hamburg, N. Y.; E. C. Minas & Co., Hammond, Ind.; R. D. & C. O. Britton Company, Hartford, Conn.; J. E. Carroll, Hollywood, Cal.; Alamo Automobile Company, Houston, Tex.; Edgar Bros., Imperial, Cal.; Edwin Wells, Jamestown, N. Y.; Smith Bros., Lawrence, Mass.; McKenzie & Bellows, Long Beach, Cal.; C. W. Hobson Company, Los Banos, Cal.; Pence Auto Company, Minneapolis, Minn.; B. F. Adams & Co., Newark, N. J.; Alling Garage Company, New Haven, Conn.; Fairchild Auto Company, New Orleans, La.; Munroe Motor Company, Pasadena, Cal.; M. K. Long, Pendleton, Cal.; Joseph Peoples, Petaluma, Cal.; Union Motor Car Company, Pittsburg, Penn.; Whip & Zander, Pomona, Cal.; Ideal Motor Car Company, Pueblo, Col.; J. R. Wainwright, Reno, Nev.; Oakland Auto Company, Richmond, Va.; J. Cunningham, Rochester, N. Y.; J. D. Lauppe, Sacramento, Cal.; C. S. McCormack, St. Charles, Ill.; Pence Auto Company, St. Paul, Minn.; W. J. Pruitt, Salem, Ore.; Cheeseman Auto Company, Salt Lake City, Utah; Alamo Auto Company, San Antonio, Tex.; Hunt Auto Company, San Diego, Cal.; T. W. Neely, Santa Ana, Cal.; W. H. Baxter, Springfield, Mass.; Sampson Iron Works, Stockton, Cal.; A. J. Jackson, Syracuse, N. Y.; Pacific Car Company, Tacoma, Wash.; Brownell & Burt, Taunton, Mass.; A. H. Harris, Tillamook, Ore.; Traverse City Iron Works, Traverse City, Mich.

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ACCESSORY EXHIBITORS AT THREE BIG SHOWS.

AT THE recent meeting of the Motor & Accessory Manufacturers in New York City, 18 manufacturers of such products were admitted to membership. In addition allotment of exhibition spaces at the Madison Square Garden and Grand Central Palace shows in New York City, the Coliseum display in Chicago and the Mechanics' building show in Boston were made to 174 members, as shown by the tabulation below. Each of these shows will be held two weeks. those in New York being Jan. 11-18 for pleasure cars and Jan. 20-25 for trucks; that at Chicago, Feb. 1-8 for pleasure cars and Feb. 10-15 for commercial vehicles, and that at Boston, March 8-15 for pleasure automobiles and March 19-26 for mechanical transports. Of course, it is well known that the total list of accessory exhibitors at these shows will include a number of makers who are not members of this association. This holds particularly true of the Boston display, where many of those not included in this allotment will be represented by local dealers. Others, not members, will be seen at each exhibition. The following tabulation gives the makers in this preliminary allotment, the principal product of each and the week or weeks during which they will exhibit at each show:

Name and address	Mfr. of	M. S. G.	G. C. P.	Chicago	Boston
Ajax-Grieb Rubber Co., New York City	Ajax tires	both	....	both	both
American Ball Bearing Co., Cleveland, O.	American axles	first	....	first	....
American Bronze Co., Berwyn, Penn.	Non-Gran bronzes	first	....	both	....
American Hardware Corp., New Britain, Conn.	Corbin-Brown speedometer	first	first	....	....
Atwater Kent Mfg. Works, Philadelphia	Kent Unisparker	both	....	both	....
Auburn Auto Pump Co., Boston, Mass.	Ten-Eyck pumps	first	....	first	first
Auto Parts Mfg. Co., Muncie, Ind.	Transmission gears	....	....	both	....
Automobile Supply Mfg. Co., Brooklyn, N. Y.	Newtone horn	both	....	first	both
Aurora Automatic Machine Co., Chicago	Thor motorcycle	....	first	....	....
A-Z Co., New York City	Radiators	first	....	....	....
Badger Brass Mfg. Co., Kenosha, Wis.	Solar lamps	both	....	both	....
Baldwin Chain & Mfg. Co., Worcester, Mass.	Baldwin chains	both	....	both	second
Batavia Rubber Co., Batavia, N. Y.	Batavia tires	first	....	first	first
Bijur Motor Lighting Co., New York City	Electric generators	both	....	....	....
Borne, Scrymser Co., New York City	Colonial oil	first	....	....	both
Bosch Magneto Co., New York City	Bosch magneto	both	....	both	....
Bower Roller Bearing Co., Detroit	Bower bearings	both	....	both	....
Bowser & Co., S. F., Fort Wayne, Ind.	Storage systems	both	....	both	both
Briggs Magneto Co., Elkhart, Ind.	Briggs magnetos	both	....	both	....
Brown-Lipe Gear Co., Syracuse, N. Y.	Gears	both	....	both	....
Buda Co., Harvey, Ill.	Buda motors	both	both	both	....
Budd Mfg. Co., Edward G., Philadelphia	Steel bodies	both	....	....	....
Byrne, Kingston & Co., Kokomo, Ind.	Kingston carburetor	both	....	both	....
Carnegie Steel Co., Pittsburg, Penn.	Steels	both	....	....	....
Champion Ignition Co., Flint, Mich.	AC Star plugs	both	....	both	both
Chase & Co., L. C., Boston, Mass.	Top fabrics	first	....	....	....
Chicago Drop Forge & Fdy. Co., Chicago	Drop forgings	both	....	both	....
Coes Wrench Co., Worcester, Mass.	Coes wrench	both	....	first	both
Columbia Lubricants Co. of N. Y., New York City	Monogram oil	first	....	....	first
Columbia Nut & Bolt Co., Bridgeport, Conn.	Lock nuts	both	....	....	....
Connecticut Tel. & Elect. Co., Meriden, Conn.	Ignition specialties	both	....	first	first
Consolidated Rubber Tire Co., New York City	Kelly-Springfield tires	both	....	both	both
Continental Caoutchouc Co., New York City	United States tires	both	....	both	both
Continental Motor Mfg. Co., Muskegon, Mich.	Continental motor	....	....	both	....
Continental Rubber Works, Erie, Penn.	Tires	....	first	....	....
Cook's Sons, Adam, New York City	Albany greases	both	....	first	first
Cotta Transmission Co., Rockford, Ill.	Transmission gears	both	....	both	....
Cowles & Co., C., New Haven, Conn.	Lamps and trimmings	first	....	first	....
Cramp & Sons Ship & Eng. Bldg. Co., Wm., Philadelphia	Brass materials	both	both	both	both
Detroit Lubricator Co., Detroit	Mechanical lubricators	....	....	both	....
Diamond Chain & Mfg. Co., Indianapolis, Ind.	Diamond chains	both	....	both	....
Diamond Rubber Co., Akron, O.	Diamond tires	both	....	both	both
Dixon Crucible Co., Jos., Jersey City, N. J.	Dixon's graphites	both	....	both	both
Doehler Die Casting Co., Brooklyn, N. Y.	Bearings and parts	first	....	first	....
Double Fabric Tire Co., Auburn, Ind.	Interlock inner tires	first	....	first	first
Dover Stamping & Mfg. Co., Cambridge, Mass.	Dover funnels	first	....	....	first
Dykes Co., John L. G., Chicago	Tire accessories	first	....	first	....
Edison Storage Battery Co., West Orange, N. J.	Edison batteries	both	....	both	both
Edmunds & Jones Mfg. Co., Detroit	E. & J. lamps	both	....	both	....
Eisemann Magneto Co., New York City	Eisemann magneto	both	....	both	....
Electric Storage Battery Co., Philadelphia	Storage batteries	both	....	both	both
Empire Tire Co., Trenton, N. J.	Empire tires	both	....	both	first
Endurance Tire & Rubber Co., New York City	Endurance tubes	first	....	first	first
Esterline Co., Lafayette, Ind.	Lighting systems	first	first	both	....
Federal Rubber Mfg. Co., Cudahy, Wis.	Federal tires	....	....	first	first
Findeisen & Kropf Mfg. Co., Chicago	Rayfield carburetor	both	....	both	....
Firestone Tire & Rubber Co., Akron, O.	Firestone tires	both	....	both	both
Fisk Rubber Co., Chicopee Falls, Mass.	Fisk tires	both	....	both	both
G & J Tire Co., Akron, O.	United States tires	both	....	both	both
Gabriel Horn Mfg. Co., Cleveland, O.	Signalling devices	both	....	both	....
Garage Equipment Mfg. Co., Milwaukee, Wis.	Gemco equipment	both	....	both	....
Gemmer Mfg. Co., Detroit	Steering gears	both	....	both	....
Globe Machine & Stamp. Co., Cleveland, O.	Metal boxes	both	....	both	....
Goodrich Co., B. F., Akron, O.	Goodrich tires	both	....	both	both
Goodyear Tire & Rubber Co., Akron, O.	Goodyear tires	both	....	both	both
Gould Storage Battery Co., New York City	Storage batteries	....	both	both	....
Gray & Davis, Amesbury, Mass.	Gray & Davis dynamos	both	both	both	both
Harris Oil Co., A. W., Providence, R. I.	Harris oils	both	....	both	both
Hartford Machine Screw Co., Hartford, Conn.	Bull Dog plugs	first	....	....	....
Hartford Rubber Works Co., Hartford, Conn.	United States tires	both	....	both	both
Hartford Suspension Co., Jersey City, N. J.	Tr.-Hartford sh. absorbers	both	both	both	both
Havoline Oil Co., New York City	Havoline oils	both	....	both	first
Haws, George A., New York City	Panhard oils	first	....	first	first
Hayes Mfg. Co., Detroit	Metal bodies	first	....	first	....

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Name and address	Mfr. of	M.	S.	G.	G.	C.	P.	Chicago	Boston
Heinze Electric Co., Lowell, Mass.	Heinze magnetos	both		....		....		both	both
Herz & Co., New York City	Minimax pumps	....		first		both		....	
Hess-Bright Mfg. Co., Philadelphia	Hess-Bright bearings	both		....		....		....	
Hess Spring & Axle Co., Carthage, O.	Hess axles	first		....		first		....	
Hess Steel Castings Co., Bridgeton, N. J.	Steel castings	both		....		....		....	
Hoffecker Co., Boston, Mass.	Hoffecker speedometers	first		....		first		first	
Hyatt Roller Bearing Co., Newark, N. J.	Hyatt bearings	both		....		both		....	
Ignition Starter Co., Detroit	Disco starter	first		....		first		....	
Imperial Brass Mfg. Co., Chicago	Pumps, etc.	....		....		both		....	
International Acheson Graphite Co., Niagara Falls, N. Y.	Oildag, Gredag	first		....		first		first	
Janney, Steinmetz & Co., Philadelphia	Seamless tanks	both		....		....		....	
Johnson & Co., Isaac G., New York City	Steel castings	both		....		both		....	
Jones & Co., Phineas, Newark, N. J.	Automobile wheels	both		....		....		....	
Kellogg Mfg. Co., Rochester, N. Y.	Kellogg tire pumps	first		....		first		....	
Kokomo Electric Co., Kokomo, Ind.	Kingston magnetos	both		....		both		....	
Leather Tire Goods Co., Niagara Falls, N. Y.	Woodworth treads	first		....		first		first	
Lee Tire & Rubber Co., Conshohocken, Penn.	Tires and horns	first		....		first		first	
Lefever Arms Co., Syracuse, N. Y.	Truck transmissions	both		....		both		....	
Light Mfg. & Fdy. Co., Pottstown, Penn.	Aluminum castings	both		....		....		....	
Link-Belt Co., Philadelphia	Maximum chains	both		....		both		....	
Lovell-McConnell Mfg. Co., Newark, N. J.	Klaxon horns	first		....		....		first	
Manufacturers Foundry Co., Waterbury, Conn.	Cylinder castings	both		....		....		....	
Marathon Tire & Rubber Co., Cuyahoga Falls, N. Y.	Tires	first		....		....		....	
McCord Mfg. Co., Detroit	McCord radiators	both		....		both		....	
Mezger, C. A., New York City	Windshields, plugs	first		....		....		....	
Michelin Tire Co., Milltown, N. J.	Michelin tires	both		....		first		first	
Morgan & Wright, Detroit	United States tires	both		....		both		both	
Mosler & Co., A. R., Mt. Vernon, N. Y.	Spit Fire plugs	both		....		....		....	
Motsinger Device Mfg. Co., Pendleton, Ind.	Motsinger Auto-Sparker	both		....		both		....	
Motz Tire & Rubber Co., Akron, O.	Motz tires	both		....		both		both	
Muncie Gear Works, Muncie, Ind.	Transmissions, etc.	both		both		both		both	
National Coil Co., Lansing, Mich.	Magnetos, coils	first		....		both		first	
National Tube Co., Pittsburg, Penn.	Steel tubing	both		....		both		both	
New Departure Mfg. Co., Bristol, Conn.	New Departure bearings	both		first		....		both	
New Jersey Car Spring & Rubber Co., Jersey City, N. J.	Caprinco tires	first		....		first		first	
New Miller Carburetor Co., Indianapolis, Ind.	Miller carburetors	both		....		both		....	
N. Y. & N. J. Lubricant Co., New York City	Non-Fluid oils	both		....		both		first	
Noera Mfg. Co., Waterbury, Conn.	Noera pumps	first		....		....		....	
Oliver Mfg. Co., Chicago	Peerless jacks	both		....		both		....	
Pantasote Co., New York City	Artificial leather	first		....		first		first	
Pennsylvania Rubber Co., Jeannette, Penn.	Pennsylvania tires	both		....		both		both	
Piel Co., J., Long Island City, N. Y.	Long horns	first		....		first		first	
Pittsburg Model Engine Co., Pittsburg, Penn.	Motors, transmissions	both		....		....		....	
Racine Rubber Co., Racine, Wis.	Tires	....		....		first		....	
Randall-Faichney Co., Boston, Mass.	Jericho horns	first		....		first		first	
Remy Electric Co., Anderson, Ind.	Remy magnetos	both		....		both		....	
Republic Rubber Co., Youngstown, O.	Republic tires	both		....		both		first	
Rose Mfg. Co., Philadelphia	License brackets	both		....		....		....	
Ross Gear & Tool Co., Lafayette, Ind.	Ross steering gears	both		both		both		....	
Rutenber Motor Co., Marion, Ind.	Rutenber motors	....		....		both		....	
Royal Equipment Co., Bridgeport, Conn.	Duplex brakes, Raybestos	both		....		both		....	
Sager Co., J. H., Rochester, N. Y.	Peerless shock absorbers	first		....		first		....	
Schoen-Jackson Co., Media, Penn.	Feps carburetors	first		first		first		first	
Schrader's Son, Inc., A., New York City	Tire gauges	both		both		....		....	
Schwartz Wheel Co., Philadelphia	Automobile wheels	both		....		....		....	
Seamless Rubber Co., New Haven, Conn.	Rubber sundries	first		....		first		first	
Shaler Co., C. A., Waupun, Wis.	Shaler vulcanizers	first		....		first		first	
Sheldon Axle Co., Wilkesbarre, Penn.	Sheldon axles	both		....		both		....	
Simms Magneto Co., New York City	Simms magnetos	first		both		first		first	
Smith Co., A. O., Milwaukee, Wis.	Automobile frames	both		....		both		....	
Spacke Machine Co., F. W., Indianapolis, Ind.	Air compressors	....		first		....		....	
Sparks-Withington Co., Jackson, Mich.	Fans and boxes	first		....		first		....	
Spicer Mfg. Co., Plainfield, N. J.	Universal joints	both		....		both		....	
Splitdorf Electrical Co., Newark, N. J.	Splitdorf magnetos	both		....		both		first	
Springfield Metal Body Co., Springfield, Mass.	Automobile bodies	first		....		....		....	
Standard Roller Bearing Co., Philadelphia	Ball and roller bearings	both		....		both		....	
Standard Thermometer Co., Boston, Mass.	Standard speedometers	first		first		first		first	
Standard Welding Co., Cleveland, O.	Stanweld rims	both		....		both		both	
Stewart & Clarke Mfg. Co., Chicago	Stewart speedometers	both		....		both		both	
Stromberg Motor Devices Co., Chicago	Stromberg carburetors	both		....		both		first	
Stutz Auto Parts Co., Indianapolis, Ind.	Stutz rear system	both		....		both		....	
Swinehart Tire & Rubber Co., Akron, O.	Swinehart tires	both		....		both		both	
Texas Co., New York City	Texaco oils	both		both		both		both	
Timken-Detroit Axle Co., Detroit	Timken axles	both		both		both		....	
Timken Roller Bearing Co., Canton, O.	Timken roller bearings	both		both		both		....	
Turner Brass Works, Sycamore, Ill.	Brass specialties	both		....		both		....	
United Rim Co., Akron, O.	Demountable rims	both		....		both		both	
United States Tire Co., New York City	United States tires	both		....		both		both	
Universal Tire Protector Co., Angola, Ind.	Universal treads	....		....		first		....	
U. S. Light & Heating Co., New York City	Lighting systems	both		....		both		both	
Vacuum Oil Co., Rochester, N. Y.	Vacuum Mobiloils	both		....		both		both	
Valentine & Co., New York City	Varnishes	both		....		first		first	
Veeder Mfg. Co., Hartford, Conn.	Veeder recorders	both		....		both		both	
Vesta Accumulator Co., Chicago, Ill.	Storage batteries	both		both		both		....	
Voorhees Rubber Mfg. Co., Jersey City, N. J.	Ideal inner tubes	first		....		first		both	
Walpole Rubber Co., Boston, Mass.	Walpole tires	first		....		....		....	
Warner Gear Co., Muncie, Ind.	Warner gears	both		both		both		....	
Warner Instrument Co., Beloit, Wis.	Warner Auto-Meters	....		both		both		both	
Warner Mfg. Co., Toledo, O.	Unit power plants	both		first		both		....	
Waukesha Motor Co., Waukesha, Wis.	Waukesha motors	....		....		both		....	
Weed Chain Tire Grip Co., New York City	Weed tire chains	both		....		both		first	
Western Tool & Forge Co., Brackenridge, Penn.	Drop forgings	first		....		....		....	
Weston-Mott Co., Flint, Mich.	Weston-Mott axles	both		....		both		....	
Wheeler & Schebler, Indianapolis, Ind.	Schebler carburetors	both		both		both		....	
White & Bagley Co., Worcester, Mass.	Oilzum oils	first		....		first		first	
Whitney Mfg. Co., Hartford, Conn.	Whitney chains	both		....		both		second	
Willard Storage Battery Co., Cleveland, O.	LBA batteries	both		....		both		both	
Williams Co., J. H., Brooklyn, N. Y.	Williams wrenches	both		....		both		....	
Wolverine Lubricants Co., New York City	Wolf's Head oils	both		....		both		both	
Young, O. W., Newark, N. J.	Tire repair outfits	both		....		....		....	

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The Motor Truck
Devoted to Motor Driven Business Vehicles of All Classes.

VOL. III. PAWTUCKET, R. I., DECEMBER, 1912 No. 12

LIGHT MOTOR WAGONS IN LAUNDRY SERVICE.

Largest New England Establishment Replacing District System with Direct Routes and Covering a Territory 50 Miles in Length--Utilized for Suburban Work Automobiles Have Many Qualities Besides Economy.

THE laundry that does a profitable business seldom if ever exists without vehicle equipment. As a rule patronage is scattered, at least sufficiently to justify the use of animal or motor wagons for collection and delivery, and generally it may be said that under the most favorable conditions the cost of collecting and delivering the work is largely in excess of what would be expended by other enterprises for transacting a similar volume of business. To illustrate, in a shop when a sale is made the purchase is delivered to the buyer without cost unless at considerable distances. The laundryman sends for the work and returns it, making two distinct trips, and with the calls for collections and deliveries where people were absent or the packages, bundles or baskets were not ready for the regular route trips, it will be understood that there is really more vehicle travel than is represented by the two separate visits. Just what proportion this excess will represent cannot be determined with exactness, for it will vary considerably.

The business of the laundries is largest in the warmer months, as linen and clothing is more quickly soiled during that period of the year, and with the temporary residences at the shore and in the country the service is considerably larger than during the autumn, winter and spring. Some laundries depend practically upon custom from areas comparatively limited, while others secure patronage in sections widely separated. Some endeavor to serve their patrons if this can be done, even at a sacrifice of profit for a portion of the time, because in this manner their custom can be retained.

It is not possible to average conditions and it may be said that there is a very wide difference in the methods the vogue with laundries doing what may appear to be precisely the same characters of business. Each enterprise must be considered separately to understand clearly the haulage requirements, but it will be seen that the large element of transportation expense cannot be greatly reduced. That is, the public has been educated to the convenience of the work being called for and returned, and as this lessens the attention that must be given by the individual who must collect and make the washing ready in the home or place of residence, beside eliminating the labor that would be entailed by household laundering, there is

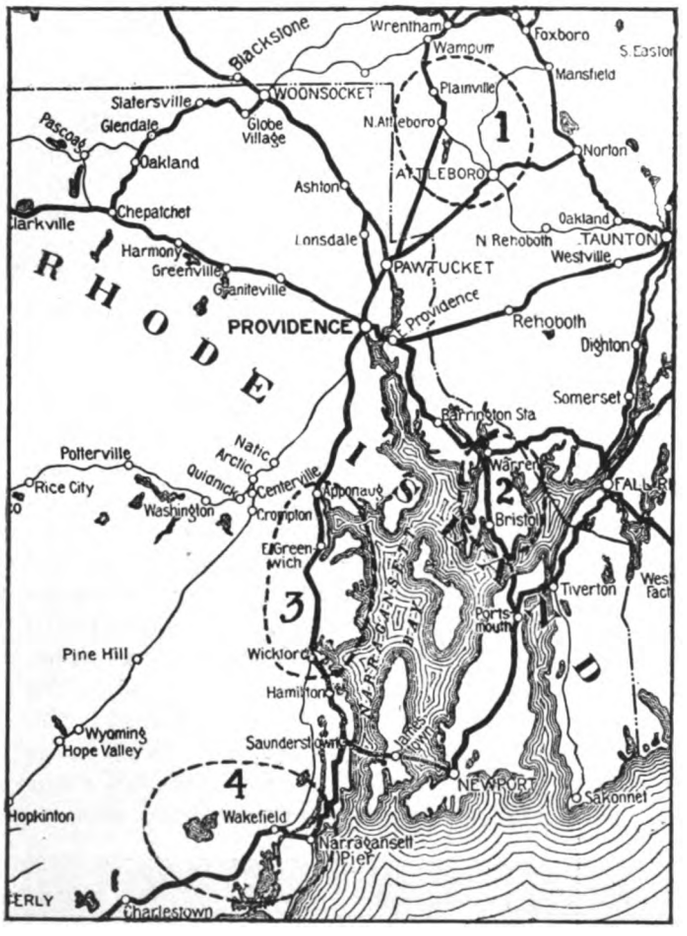


The Autocar Wagons Used by the What Cheer Laundry, Providence, R. I., in Covering Routes from 12 to 25 Miles Distant from the Plant.

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no reason to believe there can be a diminution of this cost. There are several reasons why it is probable there can be no reduction of cost unless by a complete change of methods.

This will be understood from the following illustration of the system that is very generally accepted by the laundrymen: The laundry will seek business and employs a driver whose work is to drive a horse and wagon with which he collects the washings on a stated route. He receives a commission on the amount of business his route represents, and the supposition is that this will impel him to retain his customers and add as many new patrons as he can. Of course there are limitations as to what he can do, but a man would seemingly desire to keep his route to its highest pro-



The What Cheer Laundry Routes, Dotted Line Circles Showing Approximate Areas—Nos. 1 and 3 Were Served by Horse Outfits at North Attleboro and East Greenwich; an Animal Wagon Is Still Kept at Warren, Indicated as No. 2, and No. 4 Is Cared for by an Agent with a Light Machine.

ductiveness, as he directly benefits. As horses are generally used the routes are limited to what may be considered reasonable mileage for the days they are worked. With the calls at the homes and places of residence the driver learns of the satisfaction with the work, and if he is energetic he may be able to secure additional patronage from time to time that adds materially to his commission.

Were the routes simply to places where laundry work had been left by the customers it would be necessary to pay commissions to the agents and salaries to the drivers, without conveniencing the patrons or keeping in close touch with them, and the laundry would be without personal representatives as well as paying more for the collection, though the transportation cost would be less. It will be seen that from the viewpoint of the laundryman, whose experience may be extremely varied, it is not wise to depart from the individual collection and delivery system, despite its expense.

Were the routes developed on the basis of smallest mileage that would be ideal, but they are of necessity of considerable length and occasionally are extremes. They differ widely with the work to be done. Where the family washing is taken and the clothing cleaned and returned wet, ready for drying, often not more than two hours may elapse between collection and delivery, and never more than a night intervenes. Where the washing is cleaned and dried more time is taken, and a day or more may be regarded as reasonable time. When the work is finished, that is, washed, dried and ironed and polished, as in the case with linens for wear, several days may be required. Some laundries specialize work, and in one case that came to the attention of the writer no less than 1700 washings are done weekly, each of which must be collected and delivered, making a total of approximately 3400 different calls by the drivers and a large mileage for the animals and vehicles. Other laundries combine wet washing and washing and rough drying, while the majority do these and finished work as well. The collections are made with reference to the equipment, although it may be said that the first two days of the week are devoted to collecting, the third and fourth to collecting and delivering, and the fifth and sixth to regular delivering and occasional special deliveries. There are, of course, special orders that must receive attention, and these must be provided for without much reference to the routes as made, and are either collected and delivered by the drivers or special trips are necessary.

When the routes are established it may be from soliciting, which may result in a large number of customers comparatively close together, or they may be considerable distances apart. In some instances the calls are so frequent that a driver may walk from house to house at times, the horse following him in the street. Where they are further apart the driver may ride. But the greater part of the time, sometimes as much as 60 per cent., is taken up by stops. With routes of this character the experience has been by most laundrymen that the animal is superior to the automobile, and it is maintained that a single driver can always handle a horse, but it is not generally believed practical to use a single man on a motor wagon. This opinion, however, is not shared by all. Others maintain that the time required for stopping and starting a machine minimizes its usefulness and that a driver will object to the labor necessitated by frequent calls.

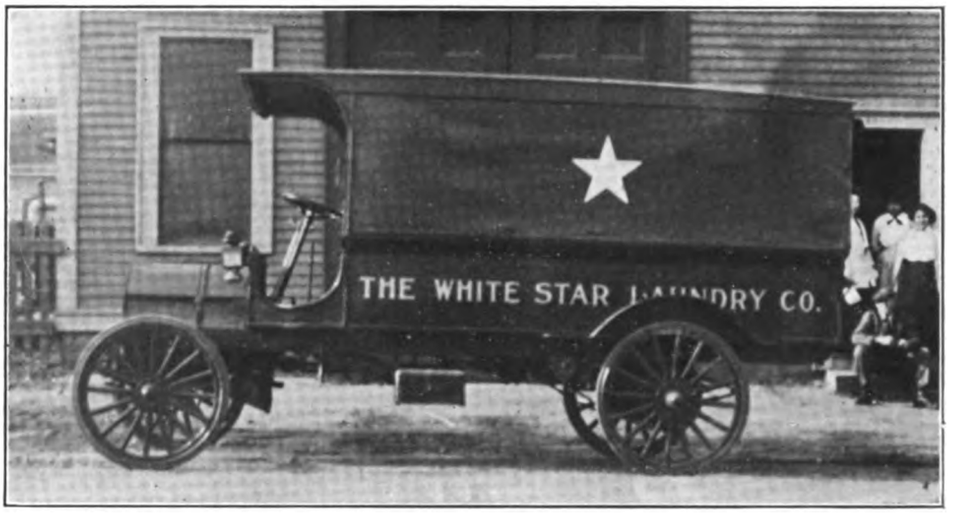
There are in the city of Providence, R. I., a number of laundries that have gasoline automobile wagons in service, and these machines have been used with

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considerable success in what may be regarded as long haul work, but they are not worked on routes only when these are considerable distances from the laundries and the time can be saved in the driving. There are different views of the economies resulting from the use of power wagons, and while it cannot be said that the comparisons have been carefully made, nor that the fullest results have been obtained, it is a safe conclusion that they will not be replaced by any other form of vehicle.

The What Cheer Laundry is maintained to be the largest enterprise of its kind in New England, having its plant in Burgess street, where more than an acre of floor area is in use and where 250 persons are employed during the winter months and 300 in the summer. This concern has in its service 17 horses and two Autocar wagons, the machines being of 1500 and 3000 pounds capacity. The smaller was purchased nearly two years ago and the larger about a year later, and prior to the purchase of the second Autocar a Cadillac delivery wagon was used for a considerable length of time, this being the first automobile in the service.

This laundry's business extends from the Attleboros in Massachusetts at the north to the villages of Saunderstown and Barber's Heights at the south, that is directly served by its own machines, and an agent who devotes his time to the work, using his own Ford delivery wagon, covers Narragansett Pier, Wakefield, Peacedale, Kingston and Rocky Brook, so the territory served is approximately 50 miles in length. Besides this the towns of Warren and Bristol on the east side of Narragansett bay are of sufficient importance to receive daily service by a man located in Warren.



The Chase 3000-Pound Wagon Utilized for Long and Suburban Routes by the White Star Laundry, Providence, R. I.

Prior to the use of automobiles the laundry had three suburban or out of town services. One included Attleboro and North Attleboro, the two having a population of about 25,000 persons. A horse and wagon were kept at North Attleboro, in which town the driver lived. This man collected the laundry work and it was shipped by express to Providence, hauled from the express delivery section to the laundry, and after cleansing was transported to the express receiving section, returned to North Attleboro and taken to a store. In the collection of laundry each work is picked up by the driver as a bundle, package or perhaps a basket, and the only essential is that the groups of articles be kept separate, which facilitates handling. It is not purposed to give attention to the cleansing methods, but it is apparent that economy of time in all the departments is desirable.

In preparing laundry for delivery conditions may vary somewhat. The volume may be greater and there are other factors that may make impossible a rigid schedule, but with the manner of serving the Attleboros customers it was necessary to make deliveries to the express receiving station absolutely on time. The boxes, packages and baskets were placed indiscriminately in a wagon and taken to the express company's receiving station, transferred to a car, delivered at North Attleboro, received by the driver and sorted at the store, and then delivered. Were there no place for sorting the packages this work would necessarily be done on the platform of the express station, where exposure to rain or snow would affect the appearance of the work or the packages, and this, with the numerous handlings and the indifference of the express company's employees in the cars, would create an appearance of the work extremely unfavorable when delivered to the customers. Under any circumstances some of the conditions could not be avoided and the renting of a store or space for sorting afforded only a partial protection from damage.

This North Attleboro station of the company did a business that required the active work of the driver and a horse and wagon each of the six working days of the week, and there was a limitation to the business that could be done with this equipment. The same character of work was carried on with an outfit located at East Greenwich, and another located at Warren. North Attleboro is 12.5 miles and Attleboro 11 miles from Providence and Warren and East Greenwich are respectively 11.5 and 12 miles from that city. To go to either of these places and return to Providence would be a long daily mileage for any horse, even were no load drawn, and to cover the routes from those centres in addition would be an impossibility with one animal. Carrying the work between Providence and these points by express practically eliminated the work of one horse, wagon and driver.

To have a knowledge of the routes it should be stated that those from North Attleboro were to Attleboro and Plainville and were in compact residential

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sections as a rule. Probably the greatest distances from the accepted central point were three miles in one direction and six miles in another. That in Warren and Bristol covers a section of perhaps seven miles length and two miles width, but that from East Greenwich extended along the shore of Narragansett bay from Hillsgrove to Wickford, a distance of about 13 miles, but seldom more than a half-mile width.

When the first Autocar was purchased the Cadillac machine had been utilized for a considerable period, but its small capacity precluded it being used for routes where it could haul what might be regarded as large loads if measured by bulk. Its use might be regarded as special work, for it was more with a view of preserving and satisfying patrons than from economizing cost. Still, the cost was comparatively small and wherever the routes were long the main economy was in time.

After experimental work with the Autocar it was decided to discontinue the East Greenwich station and to make the collections and deliveries with the machine in the same manner that the others were served with horses, eliminating one horse and wagon and the express and incidental haulage cost. Not only this, the route was extended six miles further south to Saunderstown, making the total length of the territory served approximately 20 miles, and the furthest distance from the laundry about 25 miles. While the roads were badly worn and it was severe use to drive as fast as was necessary with the machine, the wagon proved by work accomplished and the cost that it was a decided addition because of the improved service and the satisfaction afforded the customers. The wagon was found to be small for work of this nature, and this season when it was decided to give over the North Attleboro station and serve the routes direct, the 3000-pound machine was purchased. The greater capacity more nearly met the demand and it is used to make six round trips each week, leaving the first three days about 7 and returning from 4:30 to 5:30, and leaving with deliveries the last three days from 9:30 to 10:30 o'clock and returning from 5 to 6 in the afternoon.



The White 1500-Pound Wagon in the Service of Hennessey's Laundry, Providence, R. I., That Has Made 96 Miles in a Day on Suburban Routes.

With both wagons two men are used, the helper generally doing the collecting and delivering, the driver being responsible for the machine and the load and overseeing its collection and delivery. There is not a material saving in money, but where it was necessary to hold work for a day because of a delay that prevented sending by express the wagon may be held and the delivery made practically on time. Besides this the load is sorted when put on and as there are but two handlings instead of six the packages reach the customers in the best of condition. They are always fully protected and the contents are never crushed or damp. These are factors of material value and of much importance from a business point of view.

The two machines are kept at the service station of the Autocar Company, the larger with and the smaller without a maintenance contract. This eliminates the garage problem that many owners have to meet, but it is believed to be the better plan when possible, and it is regarded as an insurance of service. Costs have not been kept so as to make comparisons, but from the judgment of the owners the machines are an excellent business investment. The probability is that there will be at least another vehicle added to the equipment and used at Warren and Bristol. This, however, has not as yet been decided. With the approach of cold weather the East Greenwich route has been considerably reduced in mileage from the return of many customers to the city for the winter, and the smaller wagon will be kept busy with this work and will be used to some extent in Pawtucket, which is now served by horse wagons, some of them going as far as Lonsdale, which is about eight miles from the plant.

Nearly two years ago Hennessey's Laundry began the use of a White 1500-pound wagon, which has been used constantly since that time, and the machine is giving excellent satisfaction, having been driven considerably more than 20,000 miles. Besides this vehicle the laundry uses 10 animal wagons. It can be said that the plant is large and well established and its custom is drawn from an area considerably outside of Providence. The White chassis was bought and equipped with a body built purposely for the service, this having a large top in which is a rack that folds against the sides and is carried on two cross members when in use. Raised, the rack permits the use of the entire body capacity, and lowered it is utilized to carry the boxes when the machine is sent out for delivery.

The laundry has sought to use the wagon in what-

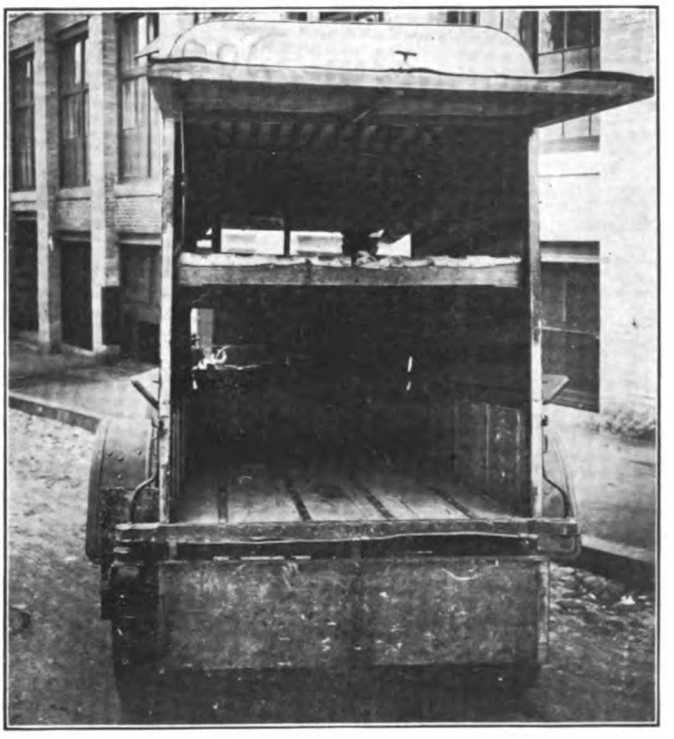
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ever work is believed to be economical, and no short route had been served by it. But where the routes are long, or are a considerable distance from the plant, the machine is regarded as an excellent proposition from every point of view. The wagon is driven by Robert McGee, a driver with a highly commendable record as a soldier, who had experience in driving in the United States service, and his training is reflected in the volume of work done and his care for the machine. Not only this, there is the application of system by him that is not always to be found with men less thoroughly trained.

An idea of the routes traversed by the wagon cannot be given by mentioning localities unknown to the reader, but it may be said that the route that covers Riverside, Barrington, West Barrington and Narragansett Terrace has a mileage of about 25 miles, and a route reaching Edgewood, Lakewood, Hoxie, Cole's, Conimicut, Bayside, Nausuket, Apponaug, River Point, Natick and Eden Park, a total of about 40 miles, both of which have been traversed regularly in a day, the former in the morning and the latter in the afternoon, making the aggregate for the day about 65 miles. The largest mileage for any single day has been 96 miles, and the average is now about 1000 miles a month, but from June 1 to about Oct. 15 the total will be about 1400 miles monthly. This gives the minimum of about 38.5 miles and a maximum of 54 miles during the periods named. On the routes served the machine is worked Mondays and Tuesdays collecting, Thursdays and Fridays delivering, with Wednesdays given over to special trips and emergency calls wherever they happen to be, while Saturday is devoted largely to delivery.

At this season of the year the machine is used for collecting on the west side of Narragansett bay, going as far as Oakland Beach, Mondays and Tuesdays it is used on the Lonsdale route, which has a mileage of about 32. This can save a great deal of time in going to and from Lonsdale and a helper is taken on this trip, so that the work is at the laundry by 4:30 or perhaps earlier. When the days are short much time is saved because the drivers cannot work as rapidly after dark. This route is delivered similarly on Thursdays. Because of the fact that the driver is paid a salary and the work is variable, it is impossible to obtain exact facts, but the work done could not be done unless with two horses and two men for each of the two routes served. The cost of fuel is not large, for the average is about five gallons of gasoline daily when the routes are long, and it is now about 25 gallons a week. This machine is cared for by the driver and it is well kept and is in excellent condition. This machine is equipped with pneumatic tires and these have given entire satisfaction, probably because the loads, though bulky, are seldom if ever to the capacity of the wagon.

The White Star Laundry is located in the southern part of Providence and it does very largely a family trade. Within the past few months its business has increased materially and it now does about 850 wet washings besides rough dried and finished work. The area covered by its routes is not large when contrasted with those described, but it is necessary to work rapidly to bring in and deliver the washings, which are collected and often returned within 2.5 hours. The plant now has a Chase one-ton wagon, which was purchased about two months ago, and previously it used a wagon which was an enclosed body installed on a Mitchell touring car chassis. This machine was limited in capacity to a comparatively few baskets and it required much more time to cover a given route. Manager Haslam bought the Chase wagon after considering the requirements, and provided a body that is large and well adapted for the work. It is possible to carry from 50 to 60 baskets and these can be packed so that they may be handled conveniently and with ease by the driver, for but one man handles the machine. The wagon is used in the longest hauls to be made and there is a decided saving in time. He estimates that it will equal the work done by two horses, wagons and men under the conditions of his business, and will considerably exceed this if the routes are long. The main proposition at the beginning of the week is to bring the washings in as quickly as possible, and to deliver them when finished, and for this and for handling rough dried and finished work the results have been entirely satisfactory. The Mitchell wagon is still used to some extent, but chiefly for special and emergency trips.



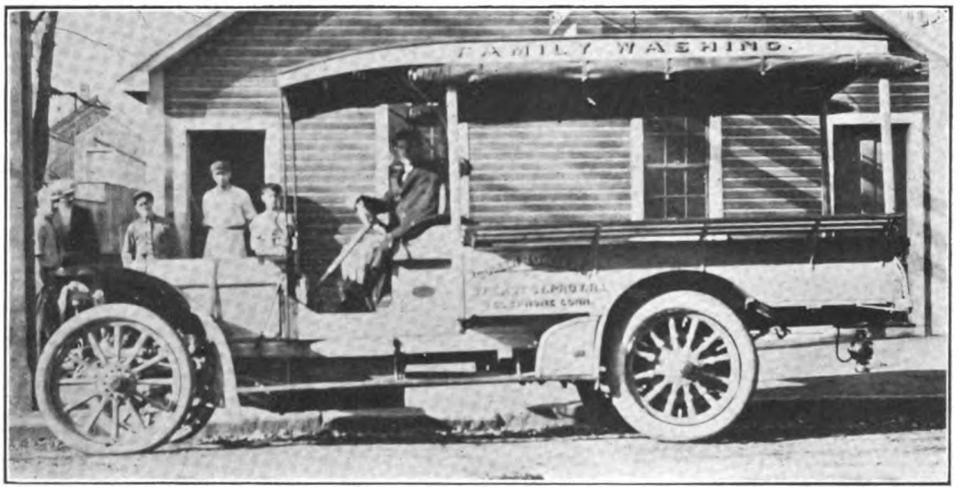
The Interior of Hennessey's Laundry Wagon, Showing the Division by Folding Rack, the Upper Section Being Used for Boxes and the Lower for Baskets.

One of the purposes for which the wagon is used is developing new business, in which it is very useful, and the possibility of serving customers at a distance is decidedly increased as compared with the usual

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methods. The laundry has found there is a considerable advertising value in the appearance of the wagons in the highways and while its value is more, generally speaking, when the routes are of length too long to be well served by horses, it has another economical quality in its large capacity. This is particularly desirable when serving families. It has been found that the machine costs practically no more to operate than the smaller wagon and it will do at least twice the work. The two are garaged by the company in its barn connected with the plant. No figures have as yet been computed for the cost of operation, but by the management the wagon is regarded as a good investment.

The firm of Cullen & Galligan, in East street, does a business with the routes in different sections, and it uses a wagon that is a converted Fiat touring car chassis, this having been sold by the original owner because it was equipped with make and break ignition. It has a 40 horsepower motor. The chassis was turned over to Joseph Cullen of Pawtucket, a blacksmith, to be adapted for service purposes, and there is



The Fiat Wagon, a Converted Touring Car Chassis, Operated by Cullen & Galligan in All Kinds of Service with Decided Success.

no question that he made a thorough job, strengthening the construction wherever needed and somewhat increasing the weight. The machine is driven by jackshaft and side chains, this being the original power transmission system of the car, and this made the job comparatively inexpensive. The speed of the machine was reduced to the maximum by sprocket changes, although there could be further reduction by change of gear sizes in the gearset. It was estimated that the wagon had a load capacity of approximately 5000 pounds, and a body was constructed for it that is unusually large, it having an enclosed space that will hold 82 baskets of the size in which washings are carried. This number is larger than any load that would ordinarily be taken, but it is possible to serve a large number of customers in a section considerably removed and yet cover the route but twice.

There are those who might assume that the conversion of a touring car is not practical, but this was a high priced chassis that was but little worn. It was with a transmission system of the type adopted for the largest and heaviest vehicles. It was strengthened and reinforced. The machine when placed in service represented but comparatively small expense. When first used it was equipped with pneumatic tires. The body design was such that practically all of the load weight is carried by the rear axle, and after a thorough trial it was decided to make a change to solid tires for the traction wheels. This was found to be wise, for the tires on the machine have been driven 12,000 miles, and appear to be good for substantial additional service. The wagon was ready for use about Oct. 1, 1911, and after 13 months' constant driving, during which about 250 miles a week was driven, it was withdrawn that the ignition system might be changed, for it was believed this might economize fuel as well as lessen the attention necessary with the make and break mechanism. This also afforded opportunity to overhaul the chassis, which was found to be in admirable condition. It may be said that one of the firm usually drives the machine and this may be one of the reasons why it has endured as it has and why such surprising results have been obtained.

The business done by the laundry was taken care of with three horses before the machine was used, and after it was in service two of these were dispensed with, but it was found possible to extend a route into Rehoboth and to increase another in East Providence, and to add to two others in South Providence. Much of the custom is wet washing, and quick collection and delivery is essential. In the summer the business is naturally larger than during the colder months and the usual speed of the vehicle is a large element of economy when it is used as it is. It might not be so economical, however, were it driven by a paid driver. The members of the firm regard it as a good investment and say that it does the work of three horses and wagons, and that while two men are required as it is used it is in every way economical. They believe that were the work such that the hauls could be from points where the work was collected by animal wagons and hauled to and from the laundry it would demonstrate a much larger saving. The large capacity of the motor undoubtedly necessitates the consumption of more fuel than might be needed with a different type of machine, but they believe that it offsets this by its large capacity. The firm owns a Regal runabout that has been used to make special and emergency trips, and this is to be adapted so that it will have increased capacity and can be better utilized.

A considerable element of economy is that the members of the firm care for the machines themselves

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and the garage expenses are comparatively small. While horses have not been dispensed with entirely it is probable that they will not be increased in number unless it is found desirable to establish routes where the Fiat machine can be utilized for transfer purposes.

With all of the instances referred to expense cannot be accurately estimated nor can service be well compared, because as a rule the work is different than what had been done with horses, but for the uses stated without exception the machines have been found economical and satisfactory.

NEWS OF THE COMMERCIAL VEHICLE INDUSTRY.

Federal Declares Stock Dividend---United States Motor Company's Sale Date Set---Several Concerns Adding to Their Capital---Other Items of Interest.

The Federal Motor Truck Company, Detroit, maker of Federal one-ton trucks, has declared a stock dividend of $94,000 and a 10 per cent. cash dividend, according to an announcement recently made by General Manager Martin L. Pulcher. The company was incorporated only three years ago with capital of $100,000 and during that time the output has steadily increased. The first year 50 commercial vehicles were manufactured, while 135 were made the second and 750 the third. The output for 1913 is scheduled at 1000 trucks, but this may be exceeded.

The company has been forced to move three times to care for increasing business and it now occupies the large and modern factory originally built for the Van Dyke Motor Car Company. Additions doubling the plant's capacity are planned for the near future. T. E. Reeder is president of the company; Edwin Denby is vice president; Garvin Denby is secretary and treasurer, and Martin L. Pulcher, to whom is ascribed a large part of the concern's success, is general manager.

MANLY DRIVE ON THE COAST.

Hydraulic Auto-Truck Corporation Licensed to Build in Los Angeles Factory.

The Hydraulic Auto-Truck Corporation has been organized in Los Angeles, Cal., to produce commercial motor vehicles utilizing the Manly hydraulic transmission, having been licensed by the Manly Drive Company of New York City, which concern controls the patent rights in this country. In addition, the corporation has secured the Pacific Coast agency for the American-La France hydraulic truck, also equipped with this drive. The directors are W. E. Barnes, H. W. Whitford, T. W. Burger, T. L. McFaddin, D. L. Whitford, J. J. Kinehan and M. B. Jacobs.

D. L. Whitford is general manager and is well known in the industry from the Atlantic to the Pacific. As early as 1899 he was associated with John Brisbane Walker in the promotion of the Mobile Company of America, then interested in steam carriages. He is said to have brought the first Daimler car, fitted with a Knight sleeve valve engine, to this country, and he has been instrumental in locating a number of branches for several automobile concerns on the Pacific Coast.

The company not only intends to build trucks of all sizes, ranging from those of one ton to six tons capacity, but also will enter the transportation field with a big line of trucks and trailers, as soon as the Panama canal is open. It is anticipated that this end of the business will enable southern California merchants to transport goods with the greatest possible dispatch, instead of being compelled to depend upon railroad service. The offices of the corporation are at Pico and Grand streets, Los Angeles.

JUDGE HOUGH SETS SALE DATE.

Expected That W. E. Flanders Will Head Reorganized United States Motor Company.

While there appears to be a number of matters that are not fully cleared up in connection with the proposed reorganization of the United States Motor Company, Judge Hough of the United States district court in New York City, has signed an order for the sale of the property Jan. 8. Bids are to be filed with the receivers at 61st street and Broadway, New York City, until 10 in the morning, and will be opened in court at 11.

The tentative decree provides that the property of the present concern shall be offered in six parcels, that of the several interests involved being separated as follows: United States Motor Company, Alden Sampson Manufacturing Company, Brush Runabout Company, Columbia Motor Car Company, Dayton Motor Car Company and Maxwell-Briscoe Motor Company.

From several reliable sources it is understood that Walter E. Flanders, at present president of the Flanders Motor Company, Detroit, is to become president of the reorganized company, although nothing definite has been made public by Mr. Flanders himself. This move is said to include the absorption of the Flanders company, and to be contingent upon the successful issue of other plans now under way. The receivers announce the appointment of Mr. Flanders as manager of the present company.

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NEAL RETIRES FROM PRESIDENCY.

Becomes Chairman of Directorate While Nash Heads General Motors Company.

After a two years' term as president of the General Motors Company, Detroit, of which the General Motors Truck Company, Pontiac, Mich., is one of the constituents, Thomas Neal is relinquishing that office, and will be succeeded by C. W. Nash, for some time past manager of the Buick Motor Company's plant at Flint, Mich.

The move is strictly in keeping with the understanding between Mr. Neal and the company when he took office. In the fall of 1910, when the big concern was refinanced and the executive offices were moved from New York to Detroit, the financial interests supporting the company realized the necessity of securing as president a man of very broad business experience. Mr. Neal was approached and urged to take the office, but he accepted with some hesitancy, because of the personal sacrifice involved, and only on condition that he might be permitted to retire at such time as the business was reestablished on a satisfactory basis. When it is known that the General Motors Company was able to show a net earning of over 17 per cent. on the common stock during the past year, there can be little doubt that the task has been accomplished.



Thomas Neal, Retiring President, General Motors Company.

To his many friends Mr. Neal is best known as a man of domestic tastes, who derives his greatest pleasure from his home life, for the enjoyment of which the past two years have given him but little time. It will be a source of much gratification in the industry to learn that he is to retain his connection with the company and will serve in a definite and official capacity as chairman of the board of directors.

PALMER-MOORE INCREASES CAPITAL.

Syracuse Marine Motor Concern Will Bring Out New Vehicle Utilizing Two-Cycle Engine.

The Palmer-Moore Company, Syracuse, N. Y., has increased its capital stock from $100,000 to $200,000 and will at once begin the manufacture of motor trucks in the plant of the Syracuse Stove Works in North Geddes street, which it has purchased. The following are the officers of the concern: President, T. G. Meachem; vice president, T. W. Meachem; treasurer, Charles L. Palmer.

For about two years the company, which formerly manufactured marine motors, has been experimenting with a two-cycle motor patented by Edward Moore and the perfected design will be embodied in the new truck, which will be known as the Moore. It will be air-cooled in the lighter type of vehicle and water-cooled in the heavier type. The plant has been appraised at $76,000 and covers 3.5 acres of land.

TAKES OVER OLIVER TRUCK.

New Company Is Organized to Continue Production of Two Commercial Types.

The Oliver Motor Truck Company was organized recently in Detroit and has purchased all material, blue prints, patterns, jigs and dies, together with patents and all future rights of manufacture of Oliver cars, from the receiver of the Oliver Motor Car Company, Detroit. Gus A. Meyer is president and general manager, while Fred J. Meyer is treasurer of the new company. Both are Detroit business men. The organization of the sales department is being intrusted to Ray F. Beach, who was formerly connected with the sales department of the Oliver Motor Car Company.

It is the intention of the Oliver Motor Truck Company to manufacture the Oliver 1500-pound light delivery wagon and the 3000-pound Oliver truck, with a few changes made for the betterment of the cars. The company will be located at 460 Lawton avenue, Detroit, Mich. It is said that the first machines will be ready for shipment in the near future. Mr. Beach recently returned from a trip through Missouri and Nebraska and reports a large demand for light delivery vehicles and trucks in that section.

NEW MODEL FROM SAVANNAH.

Several of the Vehicles Are Giving Good Service in the Hands of Their Owners.

The Savannah Auto Repair Company, Savannah, Ga., has entered the motor truck manufacturing field and has delivered several of its new vehicles to Savannah business houses. The John Sullivan, Jr., Company ordered the first truck of the company and so pleased were the officials with its service that another and larger one was ordered.

It is understood that another Savannah firm has concluded arrangements for four of the trucks and should these prove all that is claimed for them, it is probable that the Savannah Auto Repair Company will engage permanently in the manufacturing busi-

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ness, since it has good prospects of cultivating a prolific field for the truck industry.

MORE CAPITAL FOR WILLYS.

New York Concern Will Underwrite Balance of Preferred Stock and Common Will Be Increased.

Announcement has been made that William Salomon & Co., New York City, will underwrite $2,900,000 of treasury stock of the Willys-Overland Company, Toledo, O., which has an authorized capital of $10,000,000 common and $5,000,000 preferred. Only $2,100,000 of the preferred stock has been sold and the Salomon undertaking has to do with the balance. The common stock also is to be doubled, the Salomon concern to purchase $5,000,000 worth of the paper and the balance to be retained by Mr. Willys. No change in the management of the company is contemplated, or in the executive staffs of any of the subsidiary companies.

The new plans simply add a large amount of cash assets to the Willys-Overland Company, the business of which has increased to double what it was a year ago. The Willys properties consist of the Willys-Overland Company, Toledo, O.; Kinsey Manufacturing Company, Toledo; Federal Motor Works, Indianapolis, Ind.; the Garford Company, Elyria, O.; the Morrow Manufacturing Company, Elmira, N. Y., and the Gramm Motor Truck Company, Lima, O.

TO MANUFACTURE TRACTION PLOW.

Union Tool Company Will Erect Plant in California for New Production.

The Union Tool Company, Torrance, Cal., has let the contract for the erection of a factory to cost $100,000 and to be completed within 90 days. The plant will lie directly east of the Union Tool Company's $1,000,000 institution and between it and the $100,000 plant of the Pacific Metal Products Company, and will be used for the construction of traction plows and motor trucks. The building will occupy a space 82 by 240 feet and will be two stories high.

The traction plow, which will be constructed on the lower floor, will be 80 horsepower and will be capable of throwing four furrows at one time. The wheels will be six feet in height and the engine will be placed directly over the forward axle. The construction of the new machine is really an innovation in the automobile business as far as the West is concerned, and is planned for export trade as well as for use in the southwest, the Sacramento and San Joaquin valleys.

It is expected the erection of the plant will be followed shortly by the construction of plants for the manufacture of touring cars and runabouts, although at present this project has not been financed.

PEERLESS TO INCREASE CAPITAL.

Meeting of Stockholders Called to Add $7,000,000 to Present Issue of $3,000,000.

Stockholders of the Peerless Motor Car Company, Cleveland, O., maker of Peerless trucks and pleasure cars, will be asked at a special meeting Dec. 20, to consider and vote upon the proposition to increase the authorized capital stock of the company from $3,000,000, its present authorized stock, to $10,000,000.

This is to be divided, according to the plans, into 100,000 shares of $100 each, of which issue 50,000 shares shall be disposed of as preferred stock and the remainder as common stock subject to the usual restrictions. The stockholders will also vote upon the matter of authorizing the directors to dispose of the increased stock.

GILLIG TRUCK ON PACIFIC COAST.

Interesting New Light Delivery Vehicle Makes Its Appearance in San Francisco Market.

Leo Gillig of San Francisco, who has been connected with the motor car trade for several years, has entered the manufacturing field and has produced the first Gillig truck from his plant in that city. The vehicle has 1500 pounds capacity and exhibits some new and decidedly interesting features. Mr. Gillig has contracted to place 50 of his trucks on the market for the 1913 season.

The new light delivery wagon has chain drive with patented differential of the most simple design. Either solid or pneumatic tires can be used and the bodies are built to suit the convenience of the purchaser.

GOVERNMENT CALLS FOR BIDS.

Secretary of Treasury Seeks Information Concerning Motor Trucks Needed by Various Departments.

The secretary of the treasury, on behalf of the United States government, through the medium of the general supply committee, has called for bids on both gasoline and electric motor trucks. Under the law the secretary of the treasury is charged with the duty of contracting for supplies common to the needs of two or more departments and it is under this authority that he conducting the negotiations relative to these vehicles.

It is not known how many the government is to purchase during the fiscal year, but it is understood that the coming order will be for not less than six or seven cars for various departments. It is probable that the contract that the secretary enters into will cover all the trucks that will be required during this fiscal year. The treasury department will purchase three of the following capacities: One and two tons, and probably one from 1000 to 1500 pounds.

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METROPOLITAN HAULAGE WITH ELECTRICS.

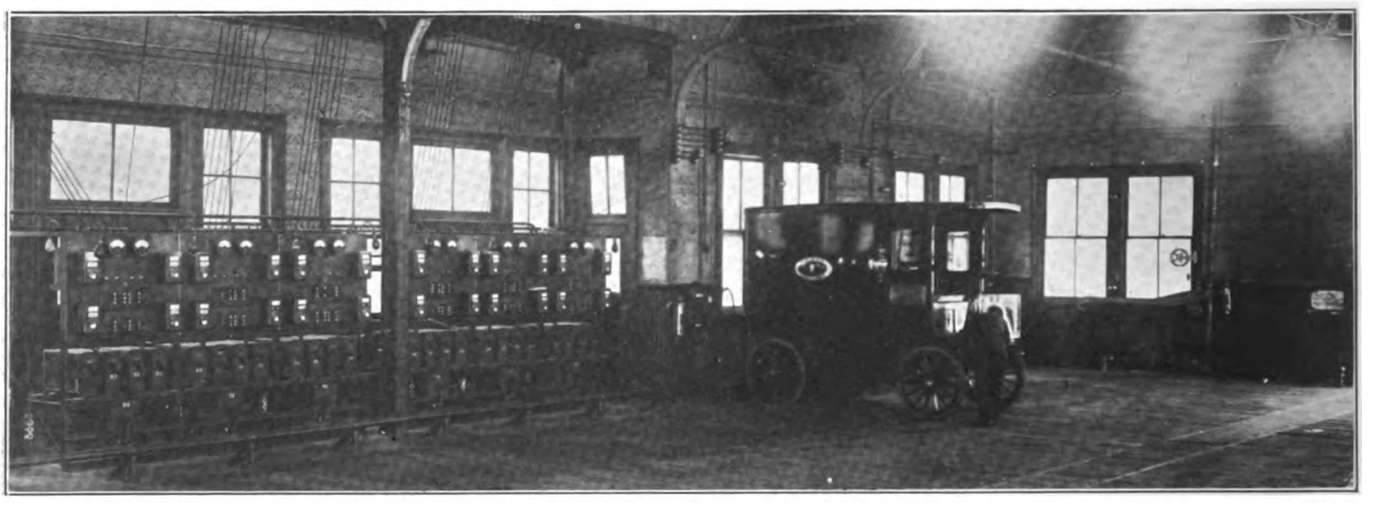
How the New York Edison Company Utilizes a Fleet of 99 Wagons, Trucks and Carriages, and the System of Operation—Practical Service Afforded by Accounting and Record That Economizes Both Expense and Time.

By William W. Scott.

IN THE consideration of haulage by road vehicle system of accounting cost and methods of operation must not be confounded. Both are separate and apart, although they have to do with the same service and equipment. In cost accounting a full understanding of the figures cannot be reached without a knowledge of the installation. If it includes a modern garage, the best of facilities, expensive vehicles, attractive appearance, careful upkeep and maintenance, the employment of experienced and dependable drivers, every item of expense, from overhead to incidentals, will be larger than were the purpose obtaining work at the least cost. But beside this there will be the uncertain element of vehicle endurance unless there is a positive manner of upkeep.

Delivery or haulage efficiency is entirely dependent upon administration and the condition of the vehicles in service. The system must be such as will insure economy. It is not possible to conceive methods that will be equal in results with two similar services, even from locations side by side, over the same highways and serving the same people. For this reason each subject must be regarded separately. Were there a uniform system of accounting it is certain that there would be material variation in detail established. For the purpose of comparison standard haulage accounting would require analysis of each service, as costs differ materially and efficiency cannot be shown without fixed rates for work performed. It would be manifestly impossible to determine such rates. Were it possible for uniformity in method of accounting the chief advantage would be to include all items of revenue or expense and to indicate the differences with relation to each service so far as local conditions were concerned, but it would not clearly indicate efficiency.

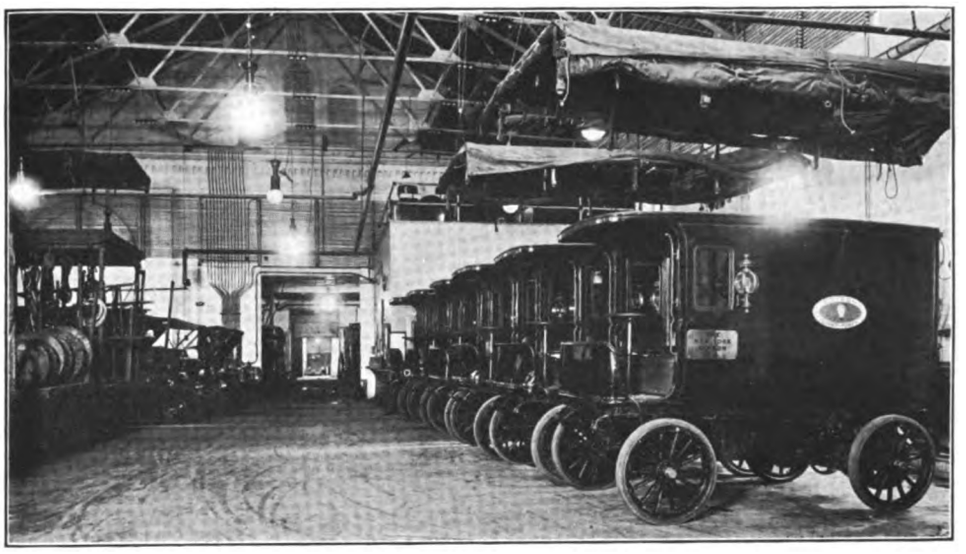
The methods of transportation must vary according to the needs of the business. The requirements must be left to the judgment of the executive. Efficiency cannot be measured by statement of expense only as applied to the subject under consideration. But it is evident that a high standard of maintenance and upkeep is productive in that it insures the continuity of service and a minimum number of vehicles, it being assumed that there is dependence upon the practical use of machines when the demands are in excess of normal. The motor wagon may be worked as many hours a day as are necessary by the use of extra drivers and at the expense of such supplies as are required and the actual wear of service.



The Abandoned 42nd Street Ferry House Now Used as a Temporary Garage by the New York Edison Company, Showing the Charging Panel—This Is Practically Deserted by Day.

The economic possibilities of electric vehicles and the practical value of systems are demonstrated very conclusively by the transportation department of the New York Edison Company, which has in its service 104 motor vehicles, of which but five are gasoline. The cost of the division is large and the aggregate expenditure is such as to justify the closest attention. But in considering this service it should be stated that the company is exceedingly broad and liberal in its relations with its employees. It considers their welfare at all times and has instituted or promoted among them activities that are in every way beneficial. For instance, there is a benefit society in which members are paid stated amounts during illness, or their families receive specific sums in the event of death. The

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Portion of the Main Floor of the 41st Street Garage, Where Light Wagons Are Stored Under Heavy Vehicle Tops Suspended Ready for Use—A Scene at Night.

employees may borrow money for building homes and repay the principal in convenient installments, the services of physicians are provided without expense, and where uniforms are desirable, as in the case of the drivers of the motor vehicles, these are provided by the company. This policy has given the company an exceptionally dependable class of employees and it has a waiting list of applicants in practically every department. This statement is made to show that the economy the company seeks is compatible with the quality of service it desires to maintain, and a financial statement would not be a just basis for comparative judgment.

The New York Edison Company is the largest corporation in the world selling electric light, power and heat, when measured by capital, and its service, while confined to the boroughs of Manhattan and the Bronx, is correspondingly large. There may be companies that cover a larger area, but none of them has a similar volume of business. The principal station is located at what is known as the Waterfront, where the power is generated, and it is sent out at high voltage to the 31 sub-stations, where it is converted to low voltage for lighting, power and domestic purposes. It may be said that the commercial service of the company extends to practically every street in the two boroughs. The number of lamps in use is approximately 5,250,000, and a volume of energy equal to lighting them is supplied to customers for power and other uses. The demands are practically continuous, though of course varying.

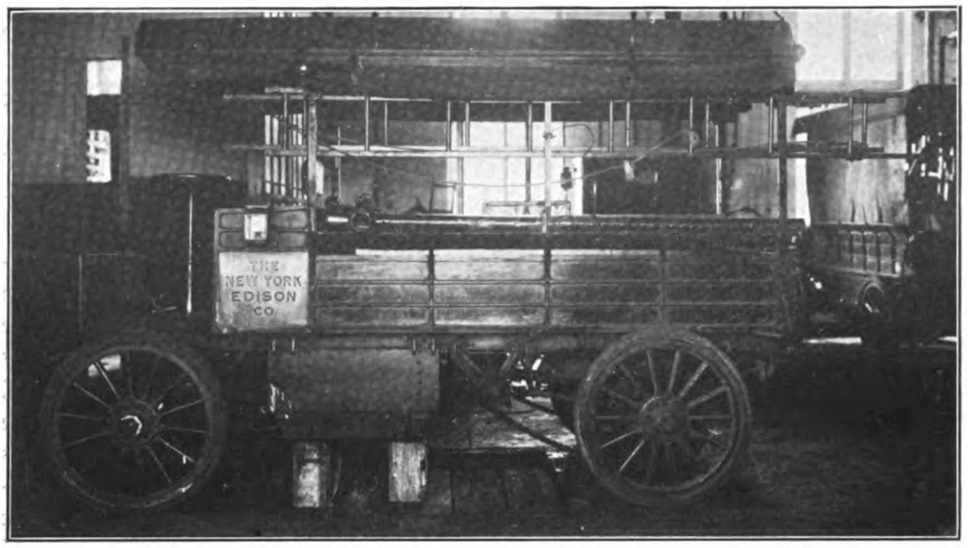
The distribution of current is by cables, largely laid in conduits, or carried on poles and buildings, and besides the maintenance there is new construction proportionate to the growth. Centring at the main station the city is cobwebbed with cables and wires, generally underground, and the distributing system is being extended daily. This work is in all sections, and to meet the demands of the customers it is necessary to haul a great deal of material and tools, while the volume of supplies furnished is constantly increasing. For instance, the company furnishes the lamps used by its customers, and it has salesrooms where lighting fixtures and all forms of electrical household and store utilities are sold, which are delivered to purchasers. It is necessary for officials of the company to visit work and to meet customers, and transportation must be provided for them. Construction material and all forms of equipment must be hauled from the manufacturers or from the shipping terminals, and shipments must be delivered to the docks or express and railroad receiving stations. Besides all this there is the incidental work of differing natures, and the street lamps must be observed and kept luminous, no matter what the weather conditions.

The executive and administrative offices of the company are at Pearl and Duane streets, but the main garage is located in 41st street, near First avenue, in a building that was at one time a boiler house. The property of the company occupies practically an entire block, in which, besides the garage, is a large machine shop and a blacksmith shop. The company uses a building at the east end of 42nd street, that was formerly a ferry house, for vehicle storage, and at 108th street and at 140th street it keeps a few wagons at the



Truck Division of the Main Floor of the 41st Street Garage in the Evening—Machines Loaded and in Readiness to Start to Complete a Construction Haulage Job.

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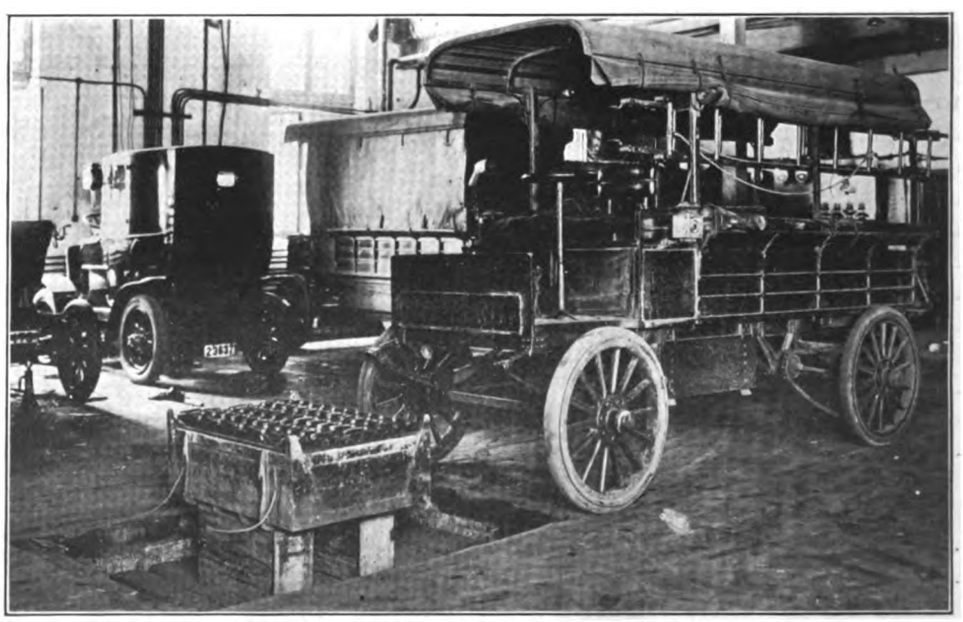


Hydraulic Lift on the Main Floor of the 41st Street Garage Lowering a Battery from an Underslung Box.

sub-stations. The company has planned the erection of a garage building sufficient to house all its vehicles and provide for a reasonable expansion, but this has not been undertaken as yet. At the 41st street garage 49 wagons, trucks and pleasure cars are kept, five of these being small gasoline runabouts. There are a number of cars housed there that are used by the officials of the company, while the remainder are wagons and trucks of different capacities. At the 42nd street garage 31 wagons and trucks are housed. At the 108th street sub-station there are 10 wagons and trucks and at 140th street three wagons, while seven wagons now charged at the 41st street station are kept standing in the street, and during the day four wagons are charged there that are used during the night. This makes a total of 60 vehicles that may be considered attached to the 41st street garage.

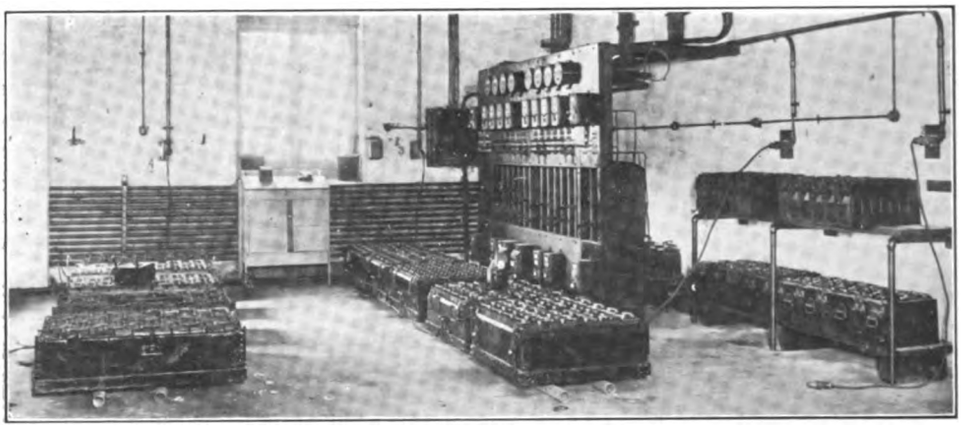
The company has owned and operated electric vehicles since 1901, when it purchased two, and its fleet now includes machines built by the Electric Vehicle Company, the Vehicle Equipment Company and the General Vehicle, Baker, Babcock, Lansden, Anderson and Walker companies. These are of 700, 1000, 2000, 3000, 4000, 7000 and 10,000 pounds capacity. Included in the equipment are eight surreys that are used by the officials, which are of different ages, and there are a number of surrey chassis adapted for wagon bodies that are used for haulage. The wagons are both open and closed and some are fitted with platform and others with express bodies. The trucks are in some instances equipped with high stakes and tops are built with bows that telescope over the tops of the stakes. The tops are provided with curtains that may be rolled, that are attached to them. These tops are kept on slings above the spaces in which the vehicles are stored, and may be lowered and installed in a very brief period when needed. This affords in a broad sense both open and enclosed bodies on the same vehicle, and permits a more diversified use than with a permanent top. Usually the machines so equipped are of the large sizes and are frequently used for hauling loads of unusual bulk, or are specially fitted for construction work.

In the 41st street garage is the battery room and the repair shop. Here all the maintenance work is carried on under the direction of H. T. Cameron, superintendent of vehicles, whose office is in the building. He has a force of 27 men busy during the day and another of 14, supervised by a foreman, at night. The garage is not equipped for heavy machine work, for this has been done at the adjacent large shop of the company, and as compared with similar stations it is apparently lacking in equipment, but the facilities are excellent despite the absence of large power tools. Here in a stock room is carried a supply of all parts ordinarily required, although for the older machines it is necessary at times to make whatever may be needed, while with some of the vehicles changes have been made that make special work necessary. For instance, where plain bearings were originally used



Battery Removed from a Machine with the Hydraulic Lift in Position for the Placing of Rollers by Which Batteries Are Handled.

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Battery Room of the 41st Street or Main Garage of the New York Edison Company, Showing the Charging Panel.

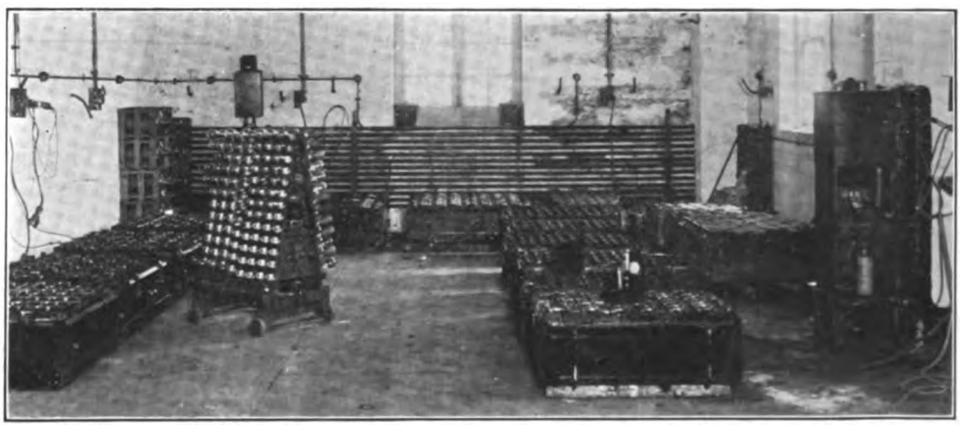
roller or annular ball bearings have been fitted, and where machines have been adapted for different work than intended by the builder they have been strengthened.

The purpose of the company is to have its machines available for service if it is within the capacity of the garage shop to keep them in operative condition. This may appear to be a very broad statement, but a wagon converted from an old surrey was shown the writer that had been overhauled and repainted in two days. The restoration represented the work of six men during the time stated and Mr. Cameron said that his ambition was to do the same work with double the workers in a single day. But despite the haste with the machine it was regarded as being in first class condition for the service required of it.

The statement has been made that the company requires a high standard of maintenance, which the quick restoration appears to controvert, but it may be well to make clear that the machines are so well kept that the work was minimized when compared with the requirements of a vehicle driven until it is in "need" of repair. Not only this, but the parts needed were in readiness, and when the work was begun it was with the sole purpose to complete it as quickly as possible and no form of delay was permitted, for the vehicular equipment of the company is by no means as large as might at times be utilized, and the entire system of work depends upon the wagons being always serviceable. It may seem strange to many to learn that if more than a single wagon is out of service at any one time the entire working schedule may be regarded as retarded. That is to say, that the service of every available vehicle is required and the superintendent of vehicles is expected to have each one in readiness for use. This is the reason for the seeming rush in repairing. Of course it must be admitted that the painting is not equal to what might be desired, but for such wagons as are referred to it is a solid color with a single coat of varnish. Yet mechanically the wagon was in every way up to the standard.

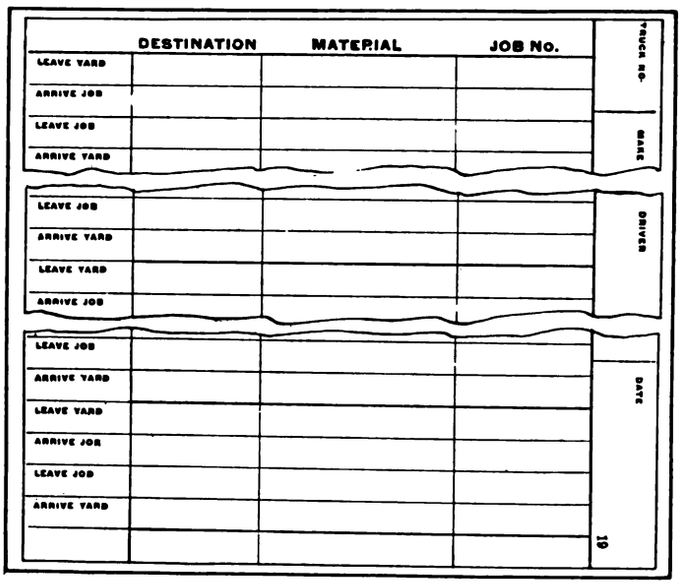
Emphasis has been made of the requirements of the company as to service to show that the condition of the machines must at all times be excellent. If vehicles are idle this means a decided delay of the work in the varying departments, the inconvenience of customers and retardation of the plans of the entire organization. The garage workers are busy at all times. When a wagon is withdrawn from use repairing is done by day, but a great deal of the care given at night is in the form of adjustments and minor restoration. It may be said that it is only by careful oversight and constant attention that the standard of maintenance can be attained. It is very improbable that there is another vehicular equipment of similar proportions in use anywhere that will show so small a loss of wagon service.

With the New York Edison Company the duty of the superintendent of vehicles is to provide the machines each day and to maintain them. The transportation department receives the requisitions for haulage from all the other divisions of the company and it assigns the work for each driver and each machine. This schedule is so prepared that when the men report at the garage at night with their machines there is posted on a board an order for the work for the following day for each man. The orders are in envelopes and are expected to be read. The envelopes and the orders remain as posted until the next morning, so that should there be a reason for the failure of a driver to report, as from illness, the driver assigned to the vehicle will have the order and the work can be taken up without delay or misunderstanding. Of course the transportation department is informed by the superintendent of vehicles as to the condition of



Another Section of the 41st Street Garage Battery Room, Illustrating the Facilities for Doing Efficient Work.

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Form A—"Job Card," Eight Inches Length and Five Inches Width, on Card, Printed in Black on White on Both Sides; Ends Notched for Filing.

the machines and the number available for each class of work. If special equipment is necessary for the vehicles it is ordered and is ready when they are sent out. In the event of special or emergency work the transportation department makes whatever changes are necessary in the schedule for the day to meet the condition. There are times, of course, when extra work is required of the drivers and the machines must be driven beyond their battery capacities, but there are 22 stations about the city where the batteries may be "boosted," in addition to the regular charging places of the company. The company does not require extra work unless it is absolutely necessary.

The garaging, as has been stated, is at four stations, in 41st, 42nd, 108th and 140th streets, and the wagons assigned to the different garages are regularly kept there at night, being washed, oiled, greased, charged and inspected, and wherever work is necessary this is done at the 41st street garage, where it will be supervised by the night foreman. There are four machines worked at night in the "trimming" department that are given attention during the day. All the wagons used in regular work are assigned and the drivers are given orders regularly. In the accounting a charge is made for service of any kind against the department for which the work is done. For instance,

THE NEW YORK EDISON CO. AUTO. DEPT.

DAILY STATION RECORD

New York, 191

Form B—"Daily Station Record," 12.5 Inches Length and 5.5 Inches Width, Printed in Black on White, with Red Longitudinal and Blue Transverse Ruling.

if a surrey is used by one of the officials his department is charged a stated price for the service, so that each division pays its proportion of the cost of the transportation, and at the termination of a given period the maintenance is divided proportionately with the work actually required. Naturally each executive desires to minimize expense and consequently the work is economized. Obviously prices for work performed could not be compared with similar work in

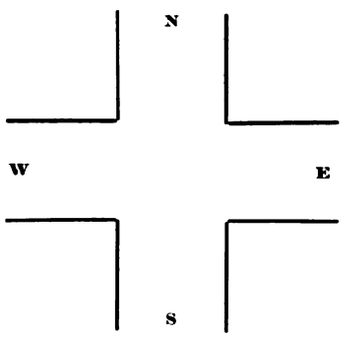
AUTOMOBILE ACCIDENTS

The New York Edison Company

No.....

Reports of accidents must be sent to **55 Duane St., Claim Department,** within 24 hours after they occur. **In case of serious or fatal accidents,** telephone details **AT ONCE** to 3000 Worth, to J. C. ROBINSON.

Name of Injured..... Address .....
Apparent Age.....Occupation.....
Extent of Injury.....
.....
Was surgical aid given and by whom.....
Did injured go home or hospital.....
Where did the accident occur.....
Was injured on sidewalk or crossing.....
Kind of paving on street.....
Did injured make any statement, and what.....
.....
State fully how accident happened, speed of machine, etc.....
.....
.....
.....
.....
.....



Witnesses ..... Address .....
" ..... " .....
" ..... " .....
" ..... " .....

Describe Machine.

Vehicle Number.....Edison Company Number.....
License Number.....Kind of Vehicle.....
Driver's name.....Home Address.....
Age.....How long in Company employ.....
Previous Experience.....
.....
Dated .....
Signed .....

Form C—"Accident Record," 15 Inches Length and 8.5 Inches Width, Printed in Black on White and Light Blue Papers, Padded for Carbon Duplication.

other cities. Transportation conditions in New York differ from those of other municipalities and it would not be possible to base judgment on statements of cost. Neither would it be practicable to place the charges for work at parity.

The system of maintaining the vehicle department is of more than ordinary interest. The methods will be followed so that the general manner of use and the records can be considered sequentially.

When a new vehicle is received by the superinten-

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DAILY REPORT FOR CHAUFFEURS

VEHICLE No.	ODOMETER RECORD TRIP	ODOMETER RECORD TOTAL	CONDITION OF VEHICLE	CHAUFFEUR
103				
420				
			DATE,..... 191	

Form D—"Daily Report for Chauffeurs," 27 Inches Length and 13.25 Inches Width, Printed in Black on Yellow, with Numbers of Vehicles Grouped by Size of Machine; Ruled for 65 Entries.

dent of vehicles at the garage it is weighed and measured, and the information indicated in form K is supplied, this being known as a "guide card." The machine is assigned a number that is used as a designation in all work and in all records. This includes the machine number, manufacturer's number, type of vehicle, capacity, name of the manufacturer, wheelbase, tread, color, weight, overall dimensions, including length, width, height and loading space; make of motors, type, voltage, amperage and speed; make of battery, type, number of cells, number of trays or crates, number of sections and weight; tires (whether solid or pneumatic) and the sizes of the front and rear wheels; the date the machine was received from the manufacturer and the date it was placed in service. To this is added the number of the license, the state in which the license is issued (some machines are licensed for New Jersey as well as New York) and year. The vehicle is inspected and tested and is then ready for use.

As stated, the orders are received from the transportation department and are posted on a board under the numbers designating the vehicles, and each driver is under normal conditions assigned a machine regularly. At the hour for reporting, either day or night, the driver notifies the timekeeper that he is ready for duty and receives a card bearing his name and the time he had reported stamped on it. He also receives a card indicated as form A, on which he is to note all the stops he makes with the machine during the day. This card will permit 14 different entries, showing when he leaves the yard (if material is hauled), when he arrives at the job, when he leaves the job and when he arrives at the yard, or one complete trip, and this also indicates the periods taken for loading and unloading. The card further shows the destination with each load, the material hauled and the number of the job on which he is working, for construction is designated in this manner. This card further shows the number of the vehicle, the make, the name of the driver and the date. This card is in form for filing.

As the driver leaves the garage he calls to the timekeeper, whose office is at the main entrance, the number of his machine and his name. These are noted by the timekeeper on form B. This record does not complete the purpose of this form.

In the event of an accident in which the driver or his vehicle have become involved during the absence from the garage the driver immediately notifies the office of the superintendent of vehicles, and having secured the information that is required he later makes a full report in writing on form C, which he signs and turns over to the superintendent, who transmits it to the claim department.

At the conclusion of the work for the day the driver returns to the garage and as he passes the office of the timekeeper he calls his name and number of his machine, which the timekeeper notes on form B. The timekeeper may make note of any condition that may be evident or which he may believe is essential. The driver leaves his machine and deposits the form A card at the office. This shows his work for the day

DAILY REPORT AUTOMOBILES OUT OF COMMISSION_____ 19

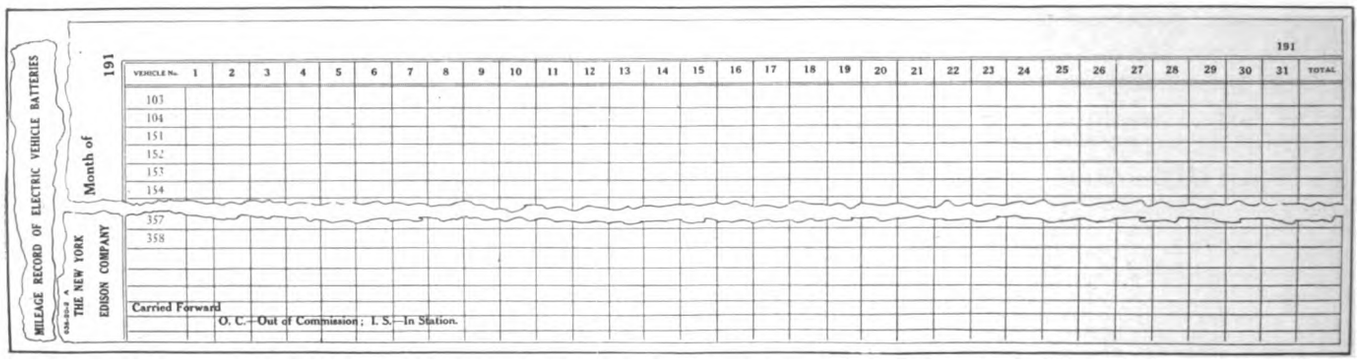
VEHICLE No.	CLASS OF REPAIRS	OUT OF SERVICE FROM	OUT OF SERVICE TO	ELAPSED TIME	TROUBLE	REMARKS

GENERAL REPAIRS—WHERE VEHICLE IS PUT IN SHOP FOR GENERAL OVERHAULING.
SPECIAL REPAIRS—WHERE VEHICLE IS TAKEN OUT OF COMMISSION TO MAKE GOOD SPECIAL FAULTS.
BREAKDOWN REPAIRS—WHERE VEHICLE GOES OUT OF COMMISSION WHILE IN SERVICE.
ACCIDENT REPAIRS—WHERE VEHICLE IS DAMAGED BY COLLISION OR OTHER ACCIDENT.

BODY
WHEELS
AXLE
TIRES
SPRINGS
STEERING GEAR
BRAKES
BATTERY
MOTOR
CONTROLLER
OUT OF POWER

Form E—"Daily Report Automobiles Out of Commission," 8.5 Inches Length and 11 Inches Width, Printed in Black on Yellow; Ruled for 20 Entries.

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MILEAGE RECORD OF ELECTRIC VEHICLE BATTERIES

Month of 191

THE NEW YORK EDISON COMPANY

VEHICLE No. 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 TOTAL

103
104
151
152
153
154
357
358

Carried Forward

O. C.—Out of Commission; I. S.—In Station.

Form F—"Mileage Record of Electric Vehicle Batteries," 12 Inches Length and 18.5 Inches Width, Printed in Black on Yellow; Ruled for 43 Entries.

and it must be filled out in every detail. The driver finds at a desk the sheet form D, on which is entered the mileage for the day, the condition of the machine (whether it does or does not need attention as he has observed from operation), and signs his name. This record is before the night foreman and from it he plans the work of his department. If a vehicle should become disabled from any cause during the day the driver notifies the superintendent, who upon notification sends an emergency wagon with a mechanic and the necessary parts or material to make restoration. If it is possible to do so the machine is repaired and work continued, but if the damage is beyond a street repair the machine is towed to the garage. The transportation department makes the necessary provision for the work.

Cessation of work of vehicles from accidents or failure of any kind are entered on form D and in addition are entered on form E, which specifies the facts, giving the number of the vehicle, class of repairs, the period when out of service, the elapsed time, the cause of failure, and remarks. The form establishes designations by which varying work and components are regularly entered on the forms. As has been stated the driver makes report of repairs, alterations or adjustments to the timekeeper, and these are entered on form B as well, so that the leaving and returning sheets of form B very well establish the period of service and the condition of each machine for the day.

From form D the daily mileage of each vehicle is transcribed on to form F, which is a monthly record, and this gives the total for the month for each machine and the total for each day and for the month for the entire number of machines in service. A similar record is kept of each battery mileage, the batteries being designated by number.

After the vehicle has been returned to the garage it is washed and placed on charge. A separate record is made for each machine and this includes the entries as shown of the charging plug number, battery number, date, vehicle number, present and previous wattmeter readings, the difference between the wattmeter readings of record, the current consumption, the time of charging and the voltmeter and ampere meter readings, these readings being taken hourly during the period of charging. Forms H and I are the records of the tires. As the solid tires generally are kept on the wheels to which they are first installed it is possible to fully account for service by assigning to each tire a serial number which is stamped on a brass tag that is attached to the felloe of the wheel. Each wheel is numbered and each wheel is used, with rare exception, on the vehicle of which it was originally a part, so if a wheel should be temporarily used on another machine its mileage and its service is always recorded. As a tire number is never transferred a record can always be followed correctly. Form H is known as the "tire time card," and when a vehicle is new the record shows the serial number shown on the tag on the wheel felloe. Where pneumatic tires are used only the maker's serial number is entered on the card. Form I is the "index card' 'and this contains the full infor-

031-26-3
30M-8-11

CHARGING CARD.

THE NEW YORK EDISON COMPANY.

AUTO. DEPT

PLUG NO._____ BATTERY NO._____

DATE_____

CAR NO. OR NAME

PRESENT WATTMETER READING

PREVIOUS DO DO

DIFFERENCE

CONSUMPTION

A. M.			P. M.		
TIME	AMPS.	VOLTS	TIME	AMPS.	VOLTS

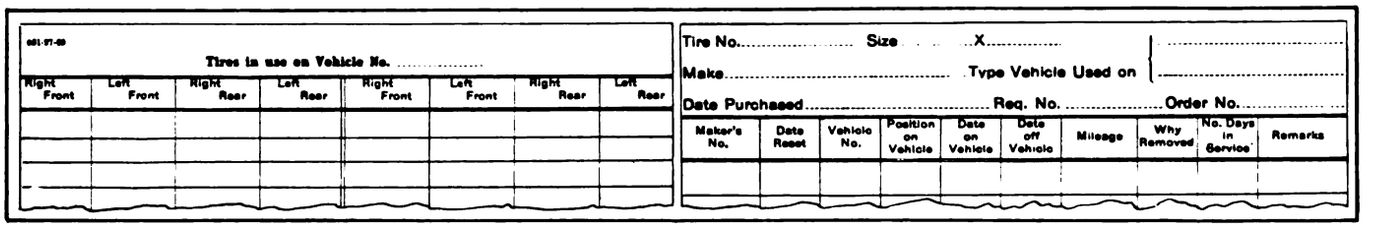
REMARKS

DAY CHARGER_____

NIGHT CHARGER _____

Form G—"Charging Card," 8.5 Inches Length and 3.5 Inches Width, Printed in Black on White; Ruled for 12 Entries.

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Form H—"Tire Time Card," Four Inches Length and Six Inches Width, Printed in Black on White, with Red Head Ruling, on Both Sides.

Form I—"Tire Index Card," Four Inches Length and Six Inches Width, Printed in Black on White, with Red Head Ruling, One Side.

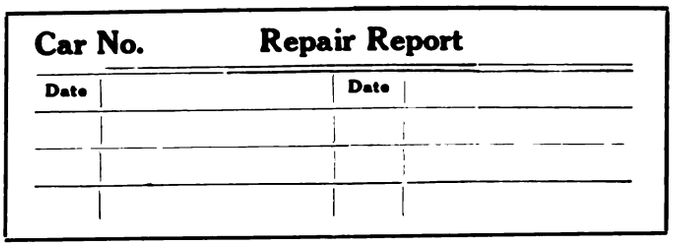
mation, including the tire number, the size, the make, the type of vehicle on which it is used, the date purchased, the requisition and the order numbers, the maker's number, the date reset, the vehicle number, the position on the vehicle, the date of installation, the date of removal, the mileage, the reason for removal, the number of days in service and remarks. Reference to form H will indicate the manner of use of any tire on a given vehicle, and form I will show the desired information relative to a tire during its entire period of use. The entries on the cards follow the tire wherever it is used and the mileage and number of days of use can be given with reference to any shoe.

Form J is the repair report, on which is noted all adjustments and restorations, and as each machine is overhauled thoroughly once a year, this record is of the minor work, but which is essential to know to establish service and cost.

Form K is the record to which reference has been made, and on the reverse of this is noted the monthly mileage and kilowatt-hours current consumption of the vehicle. The card will permit entries covering five years, and this affords sufficient detail for comparison of work and current cost to meet all reasonable requirements. When this card is filed the record of repair and the work of any character on the vehicle is filed with it, so that it is possible to obtain instantly any information relative to repair during the period the machine has been in service. The entries on form J are copied from the notes on form B, or the section of that report that deals with repairs.

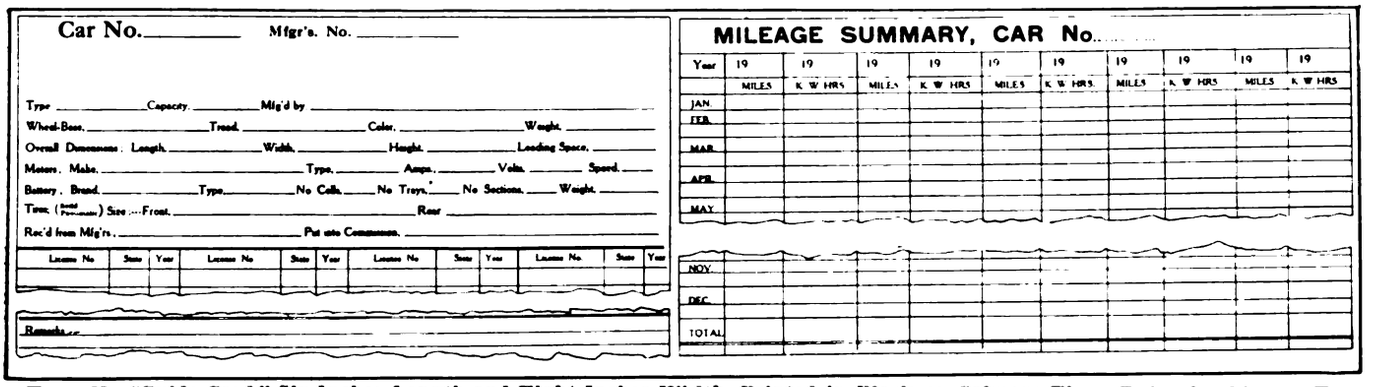
Form M is the battery record, which is exceedingly complete. It will be seen that this covers the details of type, make and construction of the battery, the repairs, mileage and current consumption, so that it is possible to make exact comparison of the work accomplished with any one battery or type. This record is regarded as of extreme importance, for by it the value of a battery with reference to cost, work and expense of operation and maintenance can be determined with great exactness. This card has been recently adopted and is the result of more than 10 years' experience with battery service.

The battery room of the garage is large, but it is not sufficient in size or equipment for the work done by this department and is for that reason crowded. The batteries of the machines are generally of the underslung type and they are put into and removed from the machines with a hydraulic lift, which is illustrated. The vehicles are run over the platform of the lift, on



Form J—"Car Repair Report," Six Inches Length and Eight Inches Width, Printed in Black on White, and Ruled for 21 Entries in Each Column.

which is placed two boxes at the distance apart to take the ends of the bottom of the battery box carrying the battery crates. The lift is raised by a hand pump to the height where the bottom rests on the boxes. The rods securing the crates are removed and the battery is lowered to a level where rollers can be placed under the box bottom and it can be rolled into the battery room. Heavy iron channels are placed at either side of the lift pit when the tread of the vehicle is narrow. By a reversal of the operation the battery, or another battery, is installed in the vehicle. With this apparatus, though it might be greatly improved, a battery can be changed by two men in perhaps five



Form K—"Guide Card," Six Inches Length and Eight Inches Width, Printed in Black on Salmon; Three Rules for License Entries and Five Lines for Remarks; the Obverse at the Left and the Reverse at the Right.

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031-27-81 VEHICLE BATTERY DATA BATTERY No.

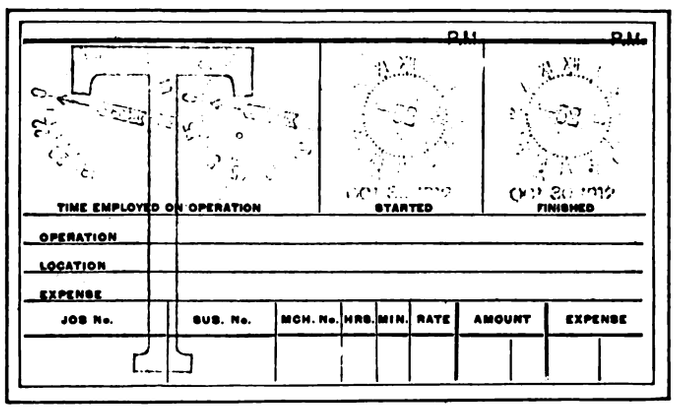
DATE	TYPE	NO. CELLS	THICKNESS OF PLATES POS.	THICKNESS OF PLATES NEG.	SEPARATE I.W.	SEPARATE R.	DIMENSIONS OF JARS L.	JARS W.	JARS H.	JARS RIBS	JARS WALL	TRAYS L.	TRAYS W.	TRAYS H.	WEIGHT OF COMPLETE CELL	WEIGHT OF COMPLETE BATTERY	1.28 S.G. ACID	STYLE AND No. OF TRAYS	DISCHARGE RATE AMP.	DISCHARGE RATE HR'S

	MAINTAINANCE REPLACED PLATES POS.	PLATES NEG.	SEPARATORS WOOD	SEPARATORS RUBBER	JARS	TRAYS	MILEAGE MONTHLY DAYS	MONTHLY MILES	TOTAL POS. DAYS	POS. MILES	NEG. DAYS	NEG. MILES	CHARGING CURRENT CONSUMPTION K. W. H. PER MONTH	K. W. H. PER MILE	K. W. H. CONSUMED DURING THE LIFE OF POS.	NEG.

Form M—"Battery Card," Six Inches Length and Eight Inches Width, Printed in Black on White; Ruled for 16 Entries Under Each Heading.

minutes. The apparatus economizes time and facilitates the handling of the batteries, some of which are exceedingly heavy.

The method of accounting for the time of the workmen is simple. When a workman reports for duty he is given two cards, the one a day card and the other a job card. The day card is stamped immediately and is again stamped when he has finished for the day.



Form N—"Workman's Job Card," Three Inches Length and Five Inches Width, Printed in Red on White; Time Stamps Are in Blue.

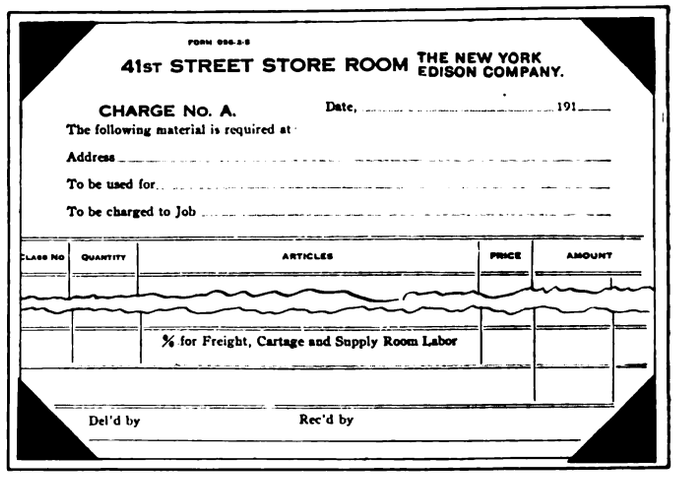
The job card is stamped when a work is begun and when it is completed, and the aggregate times shown by the job cards must coincide with the total of the day card. The job card accounts for the two working periods of a day when the work continues for that length of time, and other necessary details, such as the operation, the location and the expense attached, and from this the timekeeper makes out the pay of the mechanic for the work, which is entered under the heading "amount." One, or a series, of these will serve for a day and the aggregate will be the amount of pay due to the workman. Failure to account for time properly means loss to the workman, and if there is a period unaccounted for an explanation is required. The card is the voucher for the expense as well as the worker's pay.

Materials and parts are requisitioned by the superintendent or the night foreman as required for any work, and these are made in quadruplicate and designated as for body or chassis, giving the job and the vehicle numbers. Three of the copies go to the store room and one is retained by the garage office. At the store room the prices and the total are filled in. The requisition prices account for freight, cartage and supply room labor. The requisitions are signed by the clerk delivering the stock or material and the receiver.

The detail required in the forms may appear considerable before the system is understood, but even a casual examination will demonstrate its simplicity and its efficiency, because no essential fact is lacking and every factor in operation, maintenance and expense can be learned when desired. Each record is available and complete and its accuracy is unquestioned.

The system has been developed by more than 11 years' experience and it may be said to be sufficient to meet the requirements of a corporation that must of necessity be carefully systematized. The actual haulage is directed by a single head. There is never confusion or uncertainty, and the work is so well organized that as a rule the office is generally a day ahead of the vehicles.

This system permits meeting any emergency demand without affecting the organization materially, and with the elasticity of the service it is possible to meet requirements as they arise without complication.



Form O—"Requisition" Blank, 9.5 Inches Length and 5.5 Inches Width, Printed in Black on White, Yellow, Orange and White Paper, for Writing in Quadruplicate, the Second and Fourth Sheets Being Marked "41" and "File" Lengthwise of the Page; Ruled for 19 Entries.

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TWO-TON TRUCK ADDED TO ADAMS LINE.

ANNOUNCEMENT is made by the Adams Bros. Company, Findlay, O., of a new two-ton truck to be known as model E, which will supplement models A and D of 2000 and 3000 pounds capacity, respectively. The new machine will embody the same high grade material and workmanship noticeable of previous cars and with the exception of those modifications necessary to care for the stresses of greater carrying capacity, the new chassis will be constructed along those lines which have proven the efficiency of the Adams design.

The Adams Bros. Company is well known in the machinery world, having been prominent as a manufacturer for over 40 years and its plant is unusually well adapted to the production of high grade motor vehicles. The company made a special study of transportation problems before entering the automobile industry and has incorporated in the chassis design those components that make for simplicity of operation, durability and consequent low cost of maintenance. In the matter of accessibility the designer has taken into consideration the fact that many drivers care for their own machines and has provided easy means of reaching those parts requiring attention. As the new chassis represents the same constructional details as the smaller models, a description of these will apply to the large car with the exception of wheelbase, springs, tires, etc.

With the exception of tires and accessories the Adams trucks are constructed in the plant at Findlay, O., and all parts are subject to rigid inspection before and after being placed in the chassis. The limit of measurement is very fine and the tests of the motor very exacting.

The motor is a four-cylinder, four-cycle, water-cooled unit, cast en bloc, although it has the appearance of single units in that spaces are provided between the base of each member. A special grade of gray iron is employed and the casting is seasoned before finally being finished. By the utilization of a special machine each cylinder is accurately bored, then ground carefully to exact dimensions, and the unit is subjected to a careful inspection.

The pistons and rings receive as careful attention and are constructed of a special cast iron. The piston is ground to an accurate fit in the cylinder while the rings are ground on all working sides. The crankshaft is 3.5 per cent. drop forged nickel steel and its diameter is very liberal for the size of the motor. It is supported in three long bearings which are of a special composition. The camshaft bearings also are of liberal size and all bearings are accurately fitted and run in, after which they are readjusted, a practise making for long service with a minimum of attention. The camshaft is drop forged with cams integral, is located in the upper half of the crankcase and is actuated by spiral gears, these being accurately cut and meshed, making for silent operation.

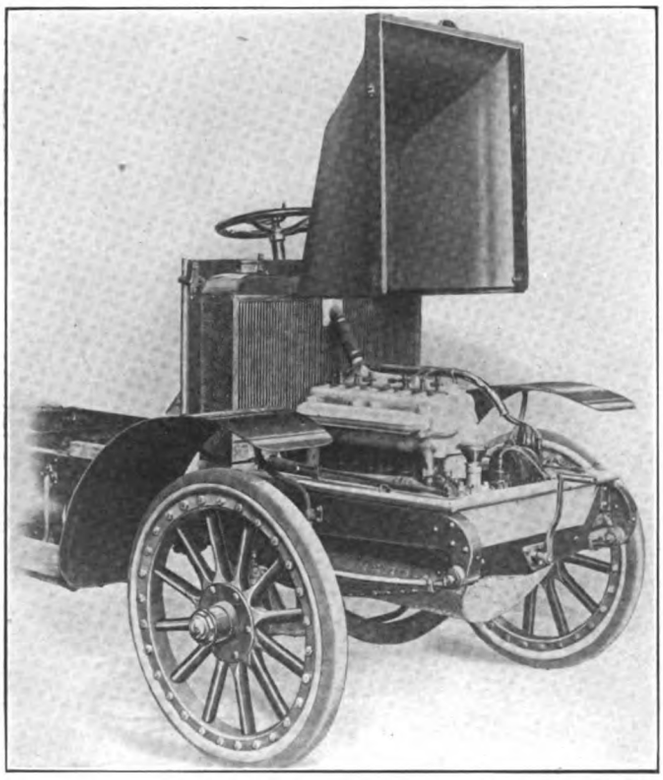


Adams One-Ton Chassis Fitted with Furniture Body—The Company Also Manufactures 1.5 and Two-Ton Models.

Cooling.

One of the noticeable features of the motor is the liberal size of the water jackets, which are cast integral. The outlet manifold is a one-piece casting which is easily removed, permitting of access to the top water jackets, while either end of the motor has large sized removable plates. Drain plugs, located at the bottom of the water jackets, permit of completely removing all fluid, thereby preventing opportunity of freezing during low temperatures.

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Presenting the Compactness and Accessibility of Motor and Method of Mounting Radiator on Dash.

Circulation is effected by a centrifugal pump actuated by a spiral gear and located in front of the engine. The cooled fluid enters the water jacket at the forward end of the motor, passes around the valves to the top of cylinders, thence to the radiator. The latter follows foreign practise in that it is mounted forward of the dash, a design protecting it from possible injury through collision when operating in crowded traffic. A vertical tube type is employed and the cooler is mounted on flexible supports, eliminating the possibility of straining through frame stresses or when traversing rough roads. A feature of the radiator is the utilization of two filler caps of liberal size. This permits the replenishment of the water from either side of the car and of completing the work in quick time. Cooling is further aided by fan blades cast integral with the flywheel at rear of the motor.

Horsepower Rating.

All motors are of the L head type with valves on the right, and have a bore of 3.875 inches and stroke of five, the horsepower being rated at 30, which the maker holds is ample for all conditions of service. The unit is bolted to the upper crankcase, which is of a high grade aluminum, while the lower half serves as the oil reservoir. Two large webs on either side of the main crankcase support the power plant on special frame members.

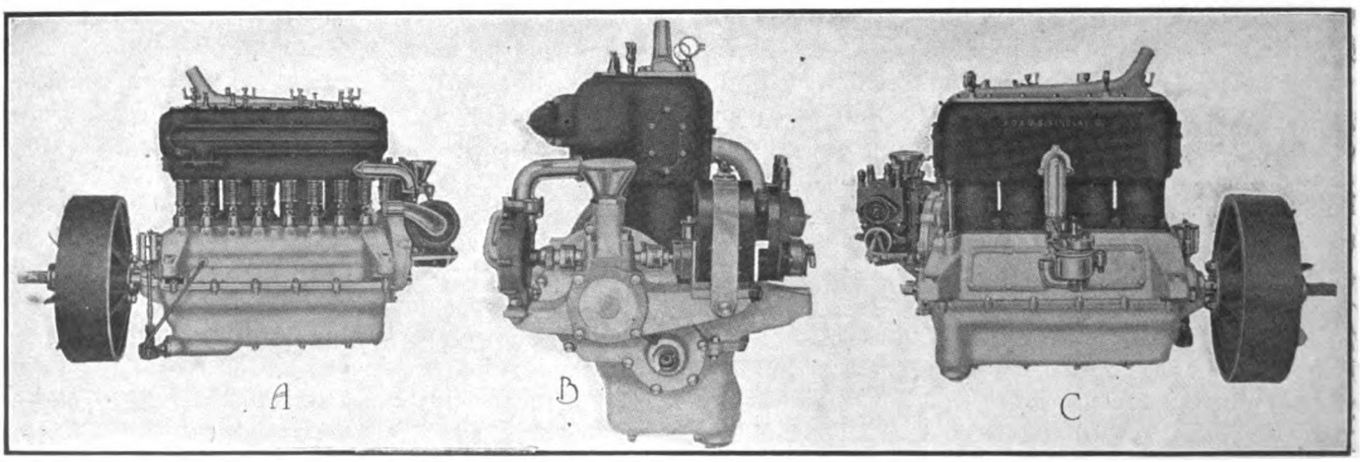
Lubrication is by a combined force feed and splash system, a constant level being maintained by a gear driven pump, the components of which are easily accessible for cleaning or inspection. Several drain plugs in the bottom of the lower crankcase make it a simple matter to remove the old lubricant when desired. An oil gauge denotes the level of the lubricant.

Dual ignition is provided, a high-tension magneto and batteries being standard equipment. The magneto is located at the forward end of the power plant and is driven off the camshaft through an Oldham coupling, as is the water pump. Directly over the gears actuating these members is a large filler formed so that all oil poured into the crankcase floods the gears with lubricant. The gears are accessible through an inspection plate, and the pump and magneto, as well as the driving mechanism, may be disassembled and replaced easily. The high-tension cables from the magneto are carried to a special tube supported by the outlet water manifold and a noticeable feature of the wiring is the shortness of the leads and protection from possible contact with metal or lubricant.

Carburetion.

A model L Schebler carburetor is employed and is located at the left of the motor. A noteworthy feature of construction is the intake pipe, this being very short and straight, eliminating the opportunity of condensation of the mixture in cold weather and making for easy starting. The intake pipe is bolted to the motor in which are cast the intake passages, a design facilitating carburetion and making for economy of fuel.

The spark plugs are located over the intake valves,



Accessibility and Simplicity Are Noteworthy Features of the Adams Power Plant: A, Valve Side of Motor; B, Front View, Showing Location of Water Pump, Magneto and Oil Filler; C, Intake Side, Indicating Well Designed Intake Pipe.

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while petcocks are fitted over the exhaust members. The valves are liberal in size and their lift is adjustable. The exhaust pipe is free from bends or curves and being of ample diameter back pressure is reduced to a minimum. The muffler is located on the right, being secured to the frame. All components of the power plant are easily accessible by lifting the hood, as will be noted from an accompanying illustration. The bearings may be inspected or adjusted easily through a large sized plate on the left hand side of the upper crankcase, and the driving gears are equally as accessible.

Dry Multiple Disc Clutch.

A dry plate multiple disc clutch is employed and the maker points out that it requires no attention and that its engagement is easy. The transmission is of the selective type, providing three speeds forward and reverse, and the gearbox is a unit with the jackshaft. The inspection plate is unusually large, permitting access to both the gearset and differential. The housing containing these members is secured to a substantial cross frame member by two arms and the design makes for a three point suspension.

The drive shaft to the jackshaft is of a special alloy steel and universal joints are provided to take up any variation in alignment which may result when the truck is traversing rough roads. The jackshaft is of liberal size and carries the service brakes, which are of the contracting type. Final drive is by roller chain.

Frame and Axles.

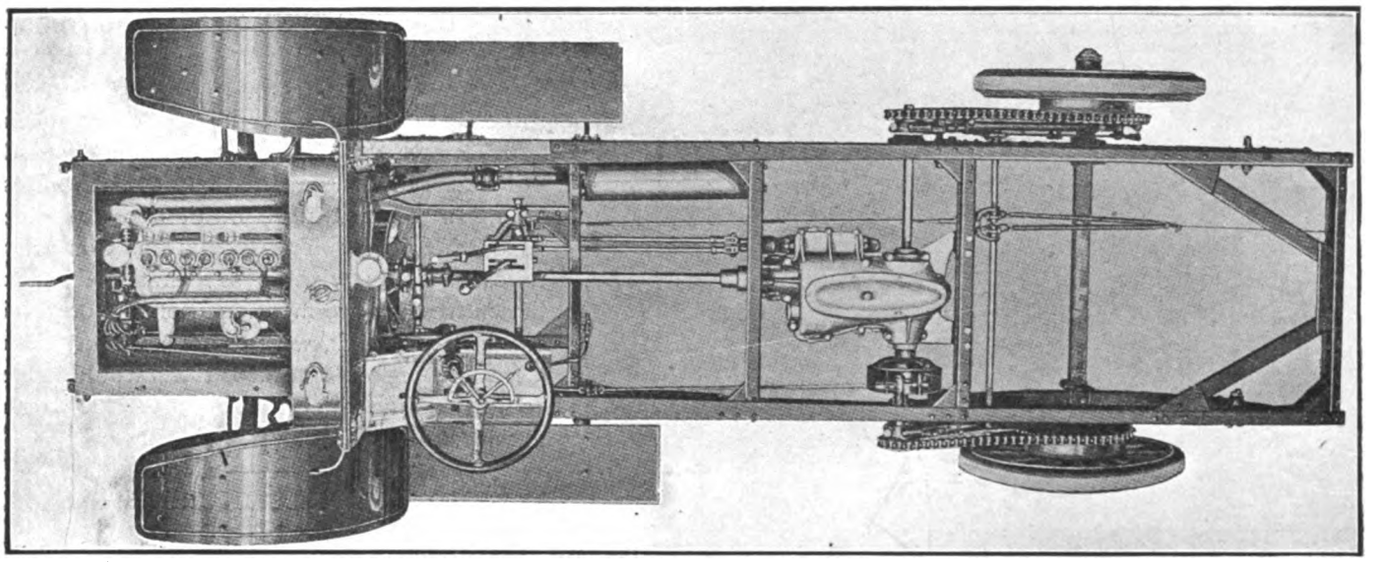
The frame is of special grade pressed steel, 38.75 inches wide, is offset between the front wheels and is of generous U section. The cross members are also of liberal dimensions and the rear portion of the frame is securely braced. The control lever quadrant is mounted on a sub-frame which also serves to support the steering column.

The front axle is of the I beam section type, of liberal size, and is provided with the conventional drop in the centre. The rear axle is of the rectangular section, a Sheldon, and the maker points out that it will withstand the most severe service.

On models A and D the front springs are semi-elliptic, 44 inches long and 2.25 wide, having eight leaves, which are ground and polished. The rear members have 11 leaves, are 44 inches long and 2.5 wide. On the model E the length of the rear springs is 50 inches.

The wheelbase is 121 or 136 inches, while that of the largest machine is 140. The tread is optional, 56 or 60 inches. Wheels are of the artillery type of carefully selected hickory. Model A is fitted with 36 by 3.5-inch solid tires in front and 36 by four in the rear. The equipment of model D varies in the rear wheels, they being equipped with 36 by three-inch dual tires. Single members, 36 by five-inch, are optional. Model E utilizes 36 by four inches in front and 36 by 3.5 dual in the rear.

Two sets of brakes are provided and both have liberal frictional surfaces. The service members are located on the jackshaft and are actuated by pedal, while the emergency members are on the rear wheels and are operated by hand lever. Equalizers are provided and either set of brakes is adjusted easily.



Plan View of the Adams Chassis, Illustrating Simplicity of Design and Accessibility of Components.

The gas and spark control levers are mounted upon the steering wheel and a noteworthy construction of the actuating rods is that they are straight and free from joints and connections, eliminating opportunity of lost motion. The steering gear is of the irreversible screw and nut Ditwiler type and is located on the left hand side of car, a design making for accessibility to the seat as well as permitting the operator a clear view of approaching vehicles. The control levers are in the centre at the right of driver and an accelerator also is provided.

The fuel capacity is 15 gallons and the equipment comprises two oil side lamps and tail light, complete set of tools, jack and horn. The standard color is battleship gray, but option is given in the painting.

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The company manufactures a number of standard bodies and is prepared to build special bodies to meet the requirements of the trade. Prices and sketches will be supplied upon application. The standard body length for the 121-inch wheelbase is eight feet, 9.5 inches long by three feet, 9.5 wide. The maximum length back of driver's seat of the chassis with 136-inch wheelbase is 11 feet.

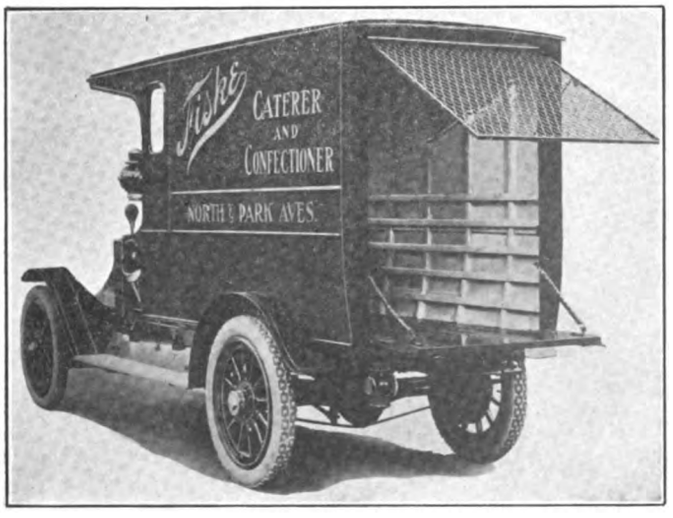
The Adams Bros. Company is confident that it has met every requirement in simplicity, efficiency and durability and that its vehicles can be maintained at a minimum cost of operation.

BODY CONSTRUCTION ON STEWART.

Maker Pays Particular Attention to the Requirements of the Individual Purchaser.

That the motor truck manufacturer must pay particular attention to the demands of the retail merchant whom he seeks to interest in his product is the policy that has been adopted by the Stewart Motor Corporation, Buffalo, N. Y., maker of Stewart commercial vehicles. An accompanying photograph indicates the extreme care and attention that is given to the rear end of these wagons.

This is of the full panel type, and it will be noted



Illustrating Rear End Construction on Panel Delivery Body Fitted to Stewart Chassis.

that the grating at the rear is hinged and fitted with a support which holds it up out of the way when desired. The tail gate is wide, closing up the lower third of the body and meeting the grating. The chains supporting the gate are enclosed in a leather cover to prevent them from marring the finish of the vehicle.

In commenting upon this construction President T. R. Lippard says: "The time is past when a manufacturer could put any kind of a body on any kind of a chassis with the expectation that retail merchants would buy it. Nowadays we have to provide the very best kind of carriage work, the handsomest finish, the best looking design, and every detail must be perfect. And this is right, for a commercial car is a moving advertisement for the store that uses it."

The Magna Automobile Company, Hartford, Conn., has become the selling agent of the Anderson Electric Car Company for that city and vicinity, and a salesroom will be opened at 10 Ford street.

PIERCE-ARROW GIVES GOOD SERVICE.

Transportation Company on Pacific Coast Establishes What It Believes to Be a New Record.

An interesting record of service given by a five-ton Pierce-Arrow worm driven truck has just been received by J. B. Livezey of the Commercial Car department of the W. E. Bush Company, Los Angeles, Cal., distributor for the maker, the Pierce-Arrow Motor Car Company, Buffalo, N. Y. The vehicle in question is owned by the Motor Transportation Company of Los Angeles. Since March it has travelled 19,054 miles and delivered 5450 tons of freight. In performing this work it has averaged 5.2 miles on a gallon of gasoline and 261 miles to a gallon of cylinder oil.

During the last four months the truck has been in service 20 hours a day. In September it covered an average distance of 127.6 miles a day or 3822 miles for the month. In commenting upon this performance the officials of the Motor Transportation Company write as follows: "We wish to say that the truck travelled the entire distance mentioned on the original set of tires, which we think, with the other data taken into consideration, makes a record that would give food for thought and by which the Pierce-Arrow worm driven truck speaks for itself."

MORELAND BUSINESS INCREASING.

Pacific Coast Manufactory Experiencing Difficulty in Keeping Ahead of Its Orders.

The Moreland Motor Truck Company, Los Angeles, Cal., produced 27 trucks during October, but is far behind in its orders. When the addition to the factory is completed this condition will be remedied and the company will have 2.5 acres of floor space. That this space is necessary is the highest commendation for the enterprise that delivered its first truck only last January. Twenty-five carloads of material are on the way to the factory and their arrival will greatly help the builder, whose main difficulty has been in securing material rapidly enough. The Caliente & Copper Creek Mining Company, Winkelman, Ariz., has just received a carload of five-ton Moreland dump trucks to be used for hauling ore.

The H. J. Heinze Company, Indianapolis, Ind., has made contract for five General Vehicle 3.5-ton trucks, which will be placed in service at the branch at Pittsburg, Penn.

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PARCELS POST AND THE TRUCK INDUSTRY.

WITH the announcement of the establishment of a domestic parcels post in connection with the postoffice department has come much speculation as to the possible effect this will have upon the automobile industry, and particularly with reference to the commercial vehicle field. This is not without foundation when it is known that a special committee was requested by Postmaster-General Hitchcock to investigate the merits of an International car, made by the International Harvester Company of America, Chicago, for this work soon after the bill creating the new service was approved by President Taft.

Under the terms of the act of Congress, approved Aug. 24, 1912, the postmaster-general is authorized to establish a domestic parcels post, embodying a zone system, Jan. 1, 1913. Oct. 3 the special committee, composed of Robert S. Share, chief postoffice inspector; John C. Koons, superintendent of the division of salaries and allowances; A. A. Fisher, chief clerk of the office of the second assistant postmaster-general; Clarence B. Hurrey, chief clerk of the office of the third assistant postmaster-general, and George L. Wood, superintendent of the division of rural mails, met with H. P. Gorsuch, postmaster at Westminster, Md., and a number of merchants, manufacturers, farmers and others in that city. The object was to formulate a test plan, which may or may not be considered as worthy of adoption when the new service is put into force.

The International car, shown in the accompanying illustration, was selected for the test, and it will be noted that its fittings were especially adapted to the work. The body is made of galvanized steel and contains several cabinets, each provided with pigeon holes and large receptacle for newspapers and magazines. They are so constructed as to be removed from the vehicle for carrying into the postoffice to be filled or emptied. All cabinets are locked with double-throw locks, and so constructed as to be absolutely dust, water and burglar proof.

The car was driven by John Didderar and John T. Coppersmith acted as carrier. The route chosen was over one of the worse stretches of road in the county. In lieu of the class of mail matter which will not come into existence until Jan. 1, copies of a local paper were utilized to demonstrate the new service. At Frederick, Congressman David J. Lewis, father of the parcels post bill, saw the first parcels post delivery, and was particularly pleased with the car selected for the purpose.

No definite information has been made public concerning the results of the test. It is not known whether or not the postoffice department will decide upon the handling of the new mail matter by motor vehicles. In fact no plans have been formulated as yet. The wording of the bill would seem to indicate clearly that it is intended that the new service shall be extended to the rural and city delivery routes, but whether or not the present carriers on these routes will do the work is open to question.

The description of fourth class mail matter is extended to include all other matter, including farm and factory products, not now embraced by the first, second or third class, not exceeding 11 pounds in weight, nor greater in size than 72 inches in length and girth combined, nor in form or kind likely to injure the person of any postal employee or damage the mail equipment or other mail matter, and not of a character perishable within a period reasonably required for transportation and delivery.

The zones are eight in number, not including rural routes and city delivery within the immediate jurisdiction of the postoffice in question. These are, respectively: All area within a radius of 50 miles, over 50 and less than 150, 150-300, 300-600, 600-1000, 1000-1400, 1400-1800, and over 1800. The fees are set forth in the following table:



International Car Utilized in Parcels Post Delivery Test at Westminster, Md.

	First pound	Each add. pound	Eleven pounds
Rural and city	.05	.01	.15
50 miles	.05	.03	.35
50-150 miles	.06	.04	.46
150-300 miles	.07	.05	.57
300-600 miles	.08	.06	.68
600-1000 miles	.09	.07	.79
1000-1400 miles	.10	.09	1.00
1400-1800 miles	.11	.10	1.11
Over 1800 miles	.12	.12	1.32

Special stamps are to be provided for this new mail service, and special sacks as well. Maps, with the zones carefully marked thereon, are to be prepared for the several postoffices of the country. The accompanying table sets forth what is expected in the way of delivery. The total appropriation thus far made

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is $750,000, and the postmaster-general must do all this work with this money. Another appropriation of $25,000 has been made for a further inquiry into the matter by a committee of six persons, members of Congress, three of whom are to be appointed by the president of the Senate and three by the speaker of the House of Representatives. More money will be needed as soon as the system is in force.

During 1911 there was expended for the delivery of mail by city carriers the sum of $35,165,067.58, and for rural free delivery, $37,145,756.63. In the latter service 41,559 carriers were employed on 41,656 different routes, with an aggregate mileage of 1,007,772. In 1907, 14,643,129,000 pieces of mail matter were delivered by the United States postoffice department. There does not appear to have been an official counting since that date, but 2,727,295,076 pieces were handled by the rural carriers alone during 1911, and it would appear that the business transacted by the department must have increased materially during the past five years. The postoffice system cost the government $237,648,926.68 last year.

MANUFACTURERS' CONFERENCE AT DETROIT.

SEVERAL matters of importance were taken up by the National Association of Automobile Manufacturers at its conference in Detroit, Nov. 13-15. While some of these had a more direct bearing upon the passenger vehicle end of the industry, considerable time was devoted to items of interest solely to motor truck producers. Representatives of a number of the large railroad corporations in the country were present to discuss the traffic situation, with particular reference to the matter of providing freight cars for the shipment of automobiles consigned to dealers. Two suggestions were offered as presenting at least a partial solution of the problem, one being more prompt unloading methods on the part of the dealers and the other greater efficiency in handling empty cars by the railroads. It was pointed out, however, that this industry, which requires specially constructed freight cars, has only about 50,000 from which to draw, while others may depend upon at least 3,000,000.

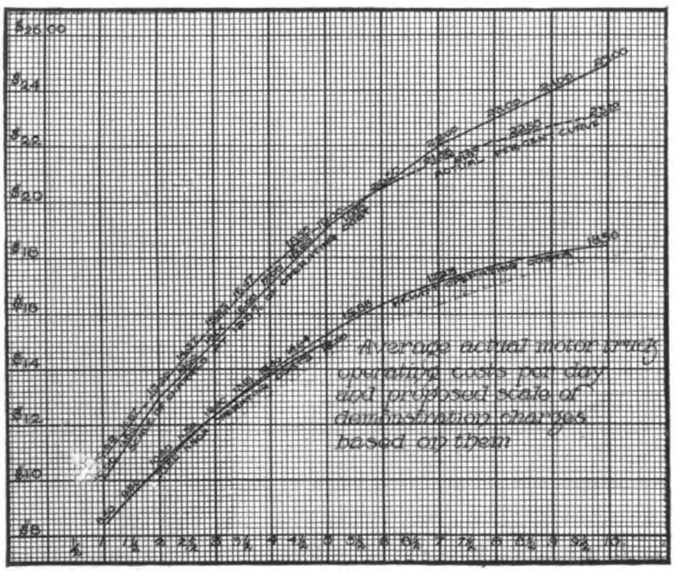


Chart Indicating Demonstration Charges Adopted by National Association of Automobile Manufacturers.

After some little discussion it was decided that the schedule of body weight allowances on motor trucks, adopted at the March meeting, should be revised so that those which may be made shall be sufficiently large to embrace all ordinary types commonly used in the different trades employing vehicles. Accordingly, the minimum scale was fixed as shown by the following tabulation:

Schedule of Body Weight Allowances in Pounds.

Load capacity	New Allowance	Old Allowance
1,000	600	500
1,500	750	...
2,000	900	600
2,500	1,000	...
3,000	1,050	700
4,000	1,200	800
5,000	1,350	900
6,000	1,500	1,000
7,000	1,600	1,100
8,000	1,700	1,200
9,000	1,750	1,300
10,000	1,800	1,400
12,000	1,900	1,600
14,000	2,000	1,800
16,000	2,100	2,000
18,000	2,200	2,200
20,000	2,300	2,400

Another subject which has been given attention by manufacturers and dealers for some time past is that of demonstration charges, and action was taken at this meeting, which is expected to result in a uniform charge based upon operating costs. It was pointed out that, theoretically at least, the cost a ton for operating a motor truck should decrease as the size of the vehicle increases, and it was held that any schedule of charges for demonstration should bear a definite relation to the actual cost of operation and maintenance. It follows that such charges should be so fixed that the cost of doing a given amount of work will be less with the power wagon than with horses.

It was found that the most elaborate tables of truck operating costs were those issued by the Hewitt Motor Company (now the International Motor Company) and the Knox Automobile Company, and that these agree closely in the average daily costs for motor trucks of two to five tons capacity. These were accepted as a basis from which to determine the average operating costs with power vehicles. The cost of trucking with horses was calculated from the best information at hand. The result in each instance is presented in an accompanying tabulation.

In explanation, it should be stated that the horse figures show the average maximum day's work with animals. The table indicates that it costs twice as much to do the work with horses as with motor trucks, even allowing only five hours running each day with the mechanical transport. If the waiting time is cut down one-half by quick loading methods,

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Cost of Trucking with Horses.

Tons	Horses	Daily rate	Miles a working day	Ton-miles	Ton-mile rate, cents
1	1	$5.50	16	16	34.37
2	1	6.50	16	32	20.31
4-5	2	8.50	12	48-60	17.70-14.16
8-10	4	17.50	12	96-120	16.35-14.58

Cost of Operating Motor Trucks.

Capacity, tons	Av. daily cost	Approx. av. daily cost	N. A. A. M. speed rating	Ton-miles 5 hours	Ton-mile rate, cents
.5	....	....	16.0	40.00	....
1.0	$8.58	$8.50	15.0	75.00	11.33
1.5	9.50	9.50	14.0	105.00	9.04
2.0	*10.53	10.50	13.0	130.00	8.07
2.5	11.48	11.50	12.0	150.00	7.66
3.0	†12.20	12.25	11.0	165.00	7.42
3.5	13.18	13.00	10.5	183.75	7.07
4.0	†13.80	14.00	10.0	200.00	7.00
4.5	14.84	15.00	9.5	213.75	7.01
5.0	†15.00	15.50	9.0	225.00	6.88
6.0	....	16.50	8.0	240.00	6.87
7.0	17.23	17.25	7.0	245.00	7.04
8.0	....	17.75	6.0	240.00	7.39
9.0	....	18.25	5.5	247.50	7.33
10.0	18.50	18.50	5.0	250.00	7.40

*Knox, $10.60; †Knox figures, all other Hewitt.

its work capacity is increased one-half and the ton-mile rate decreased proportionately.

An accompanying chart sets forth in a graphic manner the new schedule of demonstration charges adopted by the association, these being based upon the actual operating costs, with a profit of 25 per cent. The following table not only presents the new scale, but the ton-mile rate in cents:

Schedule of Demonstration Charges.

Truck capacity	Daily cost	Ton-mile rate
1000 pounds	$10.00	25.00
One ton	10.00	13.33
1.5 tons	11.50	10.95
Two tons	13.00	10.00
2.5 tons	14.00	9.33
Three tons	15.00	9.09
3.5 tons	16.00	8.70
Four tons	17.00	8.50
4.5 tons	18.00	8.30
Five tons	19.00	8.40
Six tons	20.50	8.54
Seven tons	22.00	8.97
Eight tons	23.00	9.58
Nine tons	24.00	9.69
Ten tons	25.00	10.00

At the conclusion of the conference a banquet was held in the Hotel Pontchartrain, at which some 250 were present. During the meeting and at the banquet several representatives of the manufacturers delivered addresses of importance, some of which are given in brief form elsewhere. Among those who spoke was W. L. Day, general manager of the General Motors Truck Company, Pontiac, Mich., who spoke in part as follows:

"A recent evidence of the general trend in transportation is the delivery which has just been made to the Adams Express Company of 23 G. M. C. electrics for Detroit service and the installation of a fleet of heavy duty G. M. C. gasoline trucks by the same company in Philadelphia. The time is rapidly coming when not only big transportation companies, but merchants and manufacturers with haulage problems will appreciate the importance of standardized truck equipment and select vehicles for different classes of service from a comprehensive line that can supply any size or type of truck that individual needs demand.

"The problem of the manufacturer today is big production and big service. The manufacturer must not only be in a position to guarantee real service, but he must place himself in a position to fill in a gap at any time in case of accident or other emergency which may cripple a merchant's haulage or delivery.

"Transportation problems cannot be solved off hand by a mere statement that gasoline trucks are better here, or that electrics will be more advantageous there. A careful study of conditions is necessary, considering all angles of the service. Loads, routing, character of work, facilities for loading and unloading and a score of points — each has an important bearing on the return that can be secured from a given truck investment. It is not improbable that new types of vehicles will have to be developed to meet special needs.



W. L. Day, General Manager, General Motors Truck Company.

"A large part of the responsibility for proper truck application rests with the maker. It is he who must educate, advise and work with merchants and manufacturers to the end that the greatest efficiency and satisfaction is secured. Every business man contemplating his transportation should realize that motor trucks should be intelligently driven and intelligently cared for. There is no economy in cheap drivers or inattention to trucks. First get the right trucks built by the right company; put the right man in the driver's seat and give the right attention, and it will pay a big interest on the transportation investment."

The town of Swampscott, Mass., has taken delivery of a Baker ambulance that was designed to meet the requirements of the town's committee, and which is maintained to be an ideal equipment of the kind. The town has provided a garage for the vehicle that is equipped with a rectifier and charging panel, and the care will be given the battery and machine by the town. The ambulance is in the service of the police department.

The Connecticut Company, a subsidiary company of the New York, New Haven & Hartford Railroad Company, which operates a system of trolley lines in southwestern Connecticut, has been using an electric truck in its service at New Haven with such success that it is extremely probable a number of similar machines will replace the horses now in use within a short time. For emergency work the truck has given great satisfaction.

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INJUDICIOUS TRUCK SELLING METHODS.*

THERE are today, as nearly as can be determined, about 275 makers of commercial vehicles, while three or four years ago it would have been difficult to count 75. It is true that the demand is increasing, but it also is true that production is keeping up with the demand. We find that sales in Chicago, for instance, as shown officially by the local wheel tax registration, are increasing at the rate of about 100 per cent. a year, and it is believed that this condition is being duplicated in New York and other large cities of all the northern states.

The necessity for disposing of product in order to realize on it and devote the money to the payment of accounts, and the continuance of manufacture, is the root of numerous evils in the selling end of the business. There are two principal kinds—one originating with the factory and the other with the sales force. The executives at the factory probably believe that theirs is the best truck built, of its rated capacity and price, and they cannot see why the salesmen should have any great difficulty in selling it; consequently, they press the sales force.

The prospective purchaser professes doubt about the capacity, durability and economy of the truck, and as it is new in the market, there are no records of its long and satisfactory service with large and well known business concerns to which the salesman can point as convincing examples; hence factories feel that they must stand sponsors for, and in some way give proof of their confidence in their product. This may be in the nature of long time guarantees. It may be under some maintenance or service plan by which the company undertakes to keep the truck in running condition for a year or a period of years for a certain contract price, or even to store and take care of and furnish drivers for the truck for a certain price a day or month.

The first result of such factory policies is to realize their object—quick sales. If there were no other and adverse results, they would become common practise, but the fact is that they are going out of favor both with the manufacturer and the public. Assume that the company places a considerable number of its trucks on the same terms, and that the cost of taking care of them becomes so burdensome financially that the company is unable to meet its obligations and goes into the hands of a receiver to be reorganized in order to step out from under the weight of its maintenance contracts. Where, then, is the advantage of the guarantee? Clearly, it would have been better to have purchased a truck with a 90-day guarantee from a company doing business in a safe, business like way, that is in itself an assurance that it will remain in a solvent state and be able to supply parts for replacement so long as the truck continues in service. The ability to obtain duplicate parts and send a truck to the service station of a manufacturer or agent for repairs or overhauling is a very important one to the user, particularly if he does not maintain a fairly well equipped repair shop in his own garage, which is possible only in cases where a fleet of trucks is being operated.

The selling of trucks is not very different from the selling of other machinery and it should be done on the same sound basis. That there is such a thing as selling service on a safe and profitable basis is shown by the fact that some of our reliable factories, through their selling organizations, rent trucks by the month or year at a price which makes a profit for them on this branch of the business. Such a plan has its advantage, in that it enables the company to avoid free demonstrations, yet allows it to prove the capabilities of the truck and the price at which it can be operated, thus inducing sales.

The salesmen's difficulties are by no means imaginary. They are real and serious. In the larger cities where competition is keenest, it is not uncommon for a member of the sales force, when he calls on a prospective purchaser, to find about 10 salesmen from other truck concerns already there. The buyer holds all of the cards, and he uses one man's proposition of a discount from list price, another's to accept time payments, another's to give free demonstrations, another's giving service guarantees, etc., as a club to gain the same or greater concessions from the other salesmen. It calls for experienced salesmen to deal with such a case. It is not beyond the range of possibility that in order to gain some desired point from a company with which he wishes to deal that the buyer may lead the salesman to believe that his competitors have made greater concessions than in reality they have.

It is this situation that gives rise to the present evils of price cutting, long time payments, free demonstrations and guarantees. Of these the price cutting evil is the most serious and far reaching in its effect. In one case where an agent had worked up a prospect to a point where he thought he could close a sale at a certain amount below the list price of the truck, he secured authority from the factory to close at this lower figure, charging the difference to advertising. The deal was made on this basis.

The advertising feature derived from selling trucks to most buyers is very small unless the purchaser has great prestige in his particular line of trade. The result of this sale must be that if good material and workmanship were put into this truck, it must have been sold without a profit or even at a figure that means a loss when account is taken of all the selling and overhead expenses; hence the manufacturing company, or its selling agent, if it continues such a policy, is pretty sure to embarrass itself, or the inferior nature of the truck will be the cause of dissatisfaction

*Digest of address delivered by M. L. Pulcher, general sales manager, Federal Motor Truck Company, at conference of N. A. A. M. in Detroit.

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on the part of the buyer, and instead of an asset, the advertising he will give the truck will be of the familiar, non-desirable kind.

The demonstration problem, like most of the others, grows out of the developing conditions in the trade and the eagerness of manufacturers and their selling connections to get their new models into service in certain cities, and with large companies having national prominence. Purchasers of horses never ask for a week's demonstration of what a team can do in their service, because from past experience they know. Why is it not possible for a salesman or a maker of motor trucks that is well established in any of the larger cities to dodge the demonstration question, and point to the service the trucks are giving daily under the very eye of the prospective purchaser, who is at liberty to make inquiry himself of the users? But the salesman for a new make of truck finds he must satisfy the buyer of the truck as to the load capacity, speed, hill climbing power and general reliability of his machine.

Reasonable demonstrations in such cases are not objectionable, although they are of no value to the purchaser in determining either the cost of maintenance or the stability of the truck. The trouble is that the demonstration is subject to abuse from both sides. Not long ago a large express company sent announcements to many truck manufacturers that it was in the market for the purchase of 200 trucks and requested that each maker place one truck in its service for a year's demonstration without charge, at the end of which time the order would be given to the maker whose truck made the best showing. Had this proposal been accepted the truck industry would have shouldered the expense of doing a large volume of the express company's work without compensation.

One of the principal faults indulged in by dealers and salesmen is the making of all sorts of claims, promises and even guarantees that are not authorized by the factory. This is bad salesmanship and of a kind that causes much trouble, and must be overcome by the manufacturers. A common fault that has not been touched upon and which is open to very severe criticism, is the fact that in order to make sales themselves, salesmen knock the other fellow's truck. The effect of this kind of salesmanship creates suspicion on the part of the purchaser and delays, if not altogether prevents, the sales of trucks.

TRANSPORTATION DELAYS AT CITY TERMINALS.*

OF THE 287 motor trucks and horse wagons checked at railway and steamboat terminals in the cities of New York, Chicago and Detroit, it was discovered that these vehicles had an average delay of 11.3 minutes from the time they reached the proximity of the freight terminals until they arrived at the unloading platform and were ready to begin unloading or loading operations. Figures taken of the length of time required for these 287 vehicles to unload or load showed an average of 27.3 minutes. So that roughly speaking each vehicle waited almost half as long to get to the platform as it required to perform the loading or unloading. This loss of time cuts down the efficiency of motor trucks as well as horse vehicles.

The operator of the horse vehicle does not object seriously to this delay, because the horse must be rested and this offers a good opportunity. On the other hand, with the motor truck it is different, in that the truck does not need a rest, and every delay reduces the amount of work it can do in a day.

The investigations in all three cities showed that at certain periods of the day it is possible to so conduct traffic that little delay is caused. Between the hours of 7 and 8 in the morning 75 per cent. of the vehicles do not meet with delay, whereas at later periods in the day the maximum loss of time in Chicago ranges from 30 to 79 minutes, and in New York from 43 to 130. With vehicles held up for over two hours waiting to unload and being able to unload in less than 30 minutes, it is impossible to get that efficiency which modern transportation demands.

But all of the loss of time at freight terminals, whether in connection with railroads or steamboat docks, is not due to lack of capacity. Lack of system is a big factor in many cases. Quite frequently at railroad terminals there is not a sufficiently large executive force to issue the bills of lading as called for by the teamsters. Often 25 to 40 teamsters are seen lined up waiting for such documents and some of them have had to wait more than an hour for them. In the meantime their wagon or motor truck is standing idle in the freight yard, not only losing money for its owner, but aiding in a general congestion of the place and so holding up the entire system. If a modern bank were as poorly equipped with clerical force as some of the railroad depots, it would be impossible for it to transact its business, even if the hours were extended from sunrise to sunset.

To demonstrate that it is possible to hasten the unloading and loading time at terminal depots, it is but necessary to look at the special facilities for handling perishable goods. The employment of system will greatly ameliorate the present difficulties. To show how firmly the railroad companies are convinced of this we quote from a leading Chicago freight superintendent, who states: "If motor trucks were used exclusively at six of the big terminals in Chicago the work could be done in one-half the time and at one-third the cost. This would mean a saving in Chicago transportation at these six depots of $4,320,000 a year."

The whole horse vehicle driver situation is so unsatisfactory that the dealer in motor trucks will have to give it most careful investigation or he will meet with disappointment.

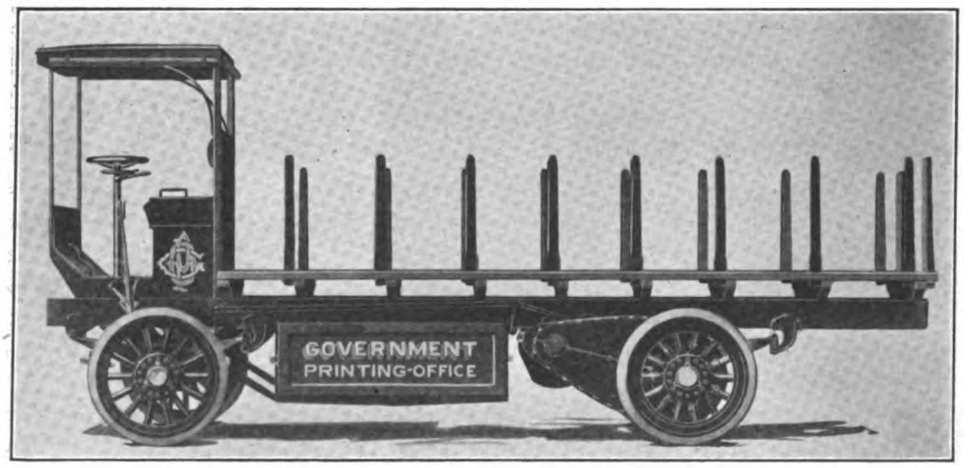
*Extract from paper read by David Beecroft of Chicago at N. A. A. M. conference in Detroit.

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THE BAKER FOUR-TON ELECTRIC TRUCK.

THE Baker Motor Vehicle Company, Cleveland, O., is now building an electric truck that has a capacity of four tons, and a tractor that is made in three sizes to haul loads in trailers ranging from two to eight tons. Machines of this type had not been previously made and the majority of the Baker wagons have been of two tons or less. To meet a demand for large vehicles that is constantly increasing the Baker company has produced these two types. One of the most recent deliveries of four-ton trucks was to the office of the public printer at Washington, D. C., and another has been placed in the service of the Pittsburg Plate Glass Company. The company is also filling several orders for these machines.

In general design the four-ton truck does not differ materially from the smaller Baker productions, although it is larger proportioned throughout. It has all the features of the construction and control and is built with a view of long endurance. It is claimed that it is comparatively light when the load to be carried is considered, and a feature that is entirely new in the electric truck as a type is the use of aluminum chain cases to protect the chains transmitting the power from the jackschaft to the rear wheels. The chains are run in a bath of oil and it is maintained that it is not necessary to remove the cases more than once a year and that they require but little attention after the installation of the cases.



The Baker New Four-Ton Truck, a Vehicle That Has Several Unusual Features of Design.

One of the purposes of the engineers has been to eliminate dead weight without sacrificing strength, and this has resulted in the choice of materials especially adapted for the purposes and with particular reference to the work required of a component. It is maintained that the truck is built oversize throughout with the desired factor of safety in mind and that its carrying capacity is largely in excess of the rating. The frame is built with six cross members and these are hot riveted to the side members, substantial gussets and braces further strengthening it. This does not include the member that carries the motor. The springs are large and are 3.5 inches width, and all the spring leaves are retained in alignment by clips. The spring eyes are fitted with phosphor bronze bushings and are shackled with hardened and ground bolts, and all moving spring parts are provided with compression grease cups.

The front axle is an I section drop forging of alloy steel, heat treated, and the rear axle is the same material, rectangular in form. The spring seats are formed integral. The axle spindles are large and are fitted with Timken roller bearings. The jackshaft is of the well known Baker type and the steel housing that carries the assembly is mounted in the chassis frame by a single bolt at either end that holds the fitting on the housing securely between the ears of a bracket riveted to the frame. By the removal of the bolts the jackshaft may be lowered when necessary, and the support compensates any distortion of the frame from road shock. This form of jackshaft suspension is patented. The jackshaft is mounted in four imported annular ball bearings and its operation is with the minimum of friction.

The motor is a General Electric machine, a four-pole type, series wound, and it has a capacity of 300 per cent. overload without damage. The armature shaft is mounted in annular ball bearings and the commutator is unusually large. It is claimed that the construction is such that the motor will require practically no attention during its life. It is enclosed in a steel shell and is thoroughly protected against dust and water. The drive from the motor to the jackshaft is by a Renold silent chain that is enclosed in an aluminum case and is operated in a bath of lubricant. This case is easily removable from both jackshaft and motor case should this be desirable.

These trucks are fitted with two sets of brakes, both internal expanding, acting within steel drums bolted to the spokes of the traction wheels. Each is operated independently and equalizers insure that the degree of retardation for each wheel is always alike with each set. The brakes are adjustable. They are so installed and the radius rods are so designed that there are no braking or driving strains upon the springs. The radius rods are adjustable at the forward ends. The battery cradle (all Baker machines carry the battery below the frame) is constructed of heavy angles and is designed to carry many times the weight it would normally have to sustain. The cradle is given added rigidity by channel section steel braces from the forward end to the chassis frame side member. These cradles are so arranged that the removal or installation of the batteries is at the side.

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Extreme care has been taken to insure lubrication, and wherever parts in contact are moving compression grease cups of large size have been provided. For all bearing surfaces the usual provisions have been made for oiling and greasing. All the chains are perfectly protected from the accumulation of abrasive substances.

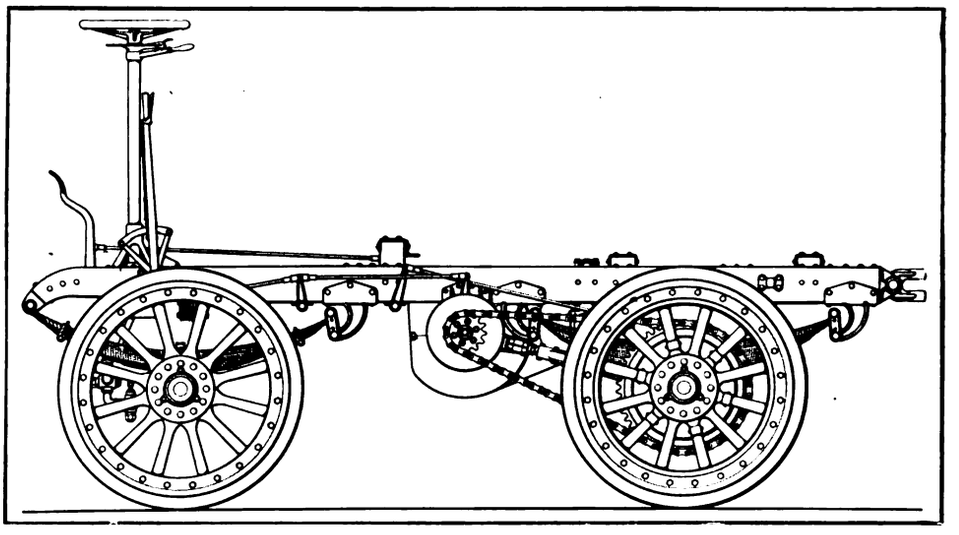
The wiring of the trucks is installed with extreme care that the cables and wire may be protected from strains, wear or acid, and that there will be no frictional contact. The insulation is extremely heavy and there should be no cause for deterioration of the system from exposure. The wiring is provided with solid copper terminals that are soldered to the wires, which construction assures the best of terminal contacts.

The truck is operated by a steering wheel located at the left side and through connections that are designed to have unusual strength and endurance. The forward axle knuckles are heavy and the tiebar and the drag link are carried forward of the axle, where they are easily accessible.

The controller is a horizontal continuous torque drum type, the design of which is patented, and it is operated by a hand lever carried on the steering column, directly beneath the steering wheel and moving on a quadrant. This lever moves a sleeve on the steering post at the base of which is fixed a bevel gear, that meshes with a bevel pinion on the controller shaft. It is claimed for this design that it is advantageous in that an operator may have both hands on or very close to the steering wheel while driving the truck, and that this manner of control adds to the factor of public safety, especially in congested traffic. The controller drum is enclosed in an aluminum case and is fully protected from dust, water, lubricant and whatever might cause deterioration. There are five forward speeds and three in reverse, and a special safety device prevents the handle slipping accidentally into reverse. The changes of speed are made without arcing or fusing and are gradual, so there is no waste of current and no strain upon the truck.

The Baker tractor design is not greatly at variance with that of the truck that has been described, but the frame is materially shorter, and the battery is carried on the chassis instead of being suspended from it as in the other Baker machines. Being used for haulage of trailers and with the carrying capacity of small consequence the loading space is practically given over to the battery. The distribution of the load is with reference to obtaining traction. The machine is built proportionately for the work that it is to do. Endurance is the main purpose, as the tractors are intended for service of contractors and in construction work, or where the transportation is especially heavy. The expectation is that in hauling trailers from excavations and on steep, short grades the requirements will be very much in excess of the normal work. The chassis frame is short and the jackshaft is almost midway between the wheels, so that with the absence of long overhangs the machine appears diminutive when its use is understood. But the proportions of the mechanism and the parts indicate strength and endurance. The frame is built to withstand the strains of hauling by cable or chain or coupling and is rigidly braced and reinforced.

In the power equipment the size of the motor varies with the capacity of the tractor and the sprocket reduction of the motor speed is such as to give the most effective application of energy and keep the wheel sprockets as far from the surface of the ground as is possible. In every other respect than has been specified the tractor follows the general construction of the four-ton truck. It is maintained by the maker that it may be assumed because the rating of the electric motor is different than any prime mover, and that it will yield its capacity at varying speeds, that the power is small, but it has been amply proven in tests much more severe than the tractors will ever be required to endure that they will haul loads and do any work that is possible for machines of this type.



Side Elevation of the Baker Tractor, Which Is Built in Capacities Ranging from Two to Eight Tons, Hauling Trailers, in Three Sizes.

Of 14 electric vehicles recently assembled before the factory of the Woods Motor Vehicle Company, Chicago, Ill., 11 represented the productions of different years, beginning with 1896, and then beginning with 1900 included one for each year.

The Anderson Electric Car Company, Detroit, claims to have the largest factory in the world devoted exclusively to the production of electric vehicles, there being no less than 12 acres under cover. This concern produces both pleasure and service machines.

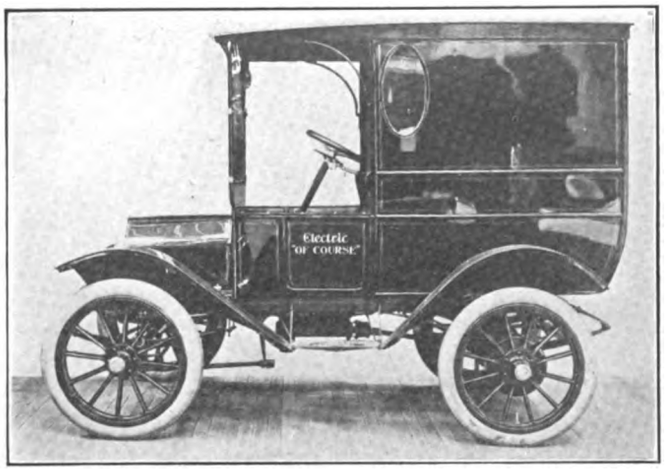
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BAKER 500-POUND DELIVERY WAGON.

Company Now Producing Vehicle of Light Capacity Intended for Fast Service.

The Baker Motor Vehicle Company, Cleveland, O., is now producing a delivery wagon of 500 pounds capacity that is intended for fast service, having a maximum speed of 20 miles an hour and a battery capacity of from 60 to 100 miles to a charge. The motor is a smaller type of those used in the larger Baker machines and the drive is by shaft and bevel gear to a semi-floating rear axle. The wheels are fitted with pneumatic tires. The body designs are open and closed. The open body has a loading space 30 inches square, and the enclosed body, with rear doors, has a space of 32 inches length and 36 inches width, measured at the seat level.

In appearance the machine is not unlike standard gasoline vehicles. With the enclosed bodies a hood is provided to protect the driver, which is equipped with



The Baker 500-Pound Shaft-Driven Delivery Wagon.

a windshield and side curtains. When built for central station work a series of trays and drawers is made in duplicate and the extra set may be packed and ready for loading, so that there shall be no delay for packing when the vehicle has finished a delivery. The wagons are equipped as are the other better known Baker productions.

MAKES RECORD DAILY MILEAGE.

General Vehicle Machine in Service in Hartford, Conn., Averages 59.33 Miles a Day.

What is regarded as a record for an electric delivery wagon of 750 pounds capacity was made recently by a General Vehicle machine in the service of Wise, Smith & Co., Hartford, Conn. The vehicle is equipped with an Edison battery. It is operated under the system of battery service inaugurated by the Hartford Electric Light Company, the wagon being sold without a battery. A regular service charge is paid and the owner has the use of a battery as often as one is needed, an exchange being made at the central station. For the service a charge is made on a mileage basis, the price a mile covering the current and the investment of the company and the care and maintenance necessary in normal use.

This machine is used in regular work and in a single week it was run 356 miles, or an average of 59.33 daily, it being estimated that it took the place of six horses, covering two regular routes and a special delivery. The Hartford Electric Light Company, which was the first public service corporation to adopt the policy of selling battery service, is now providing batteries for about 20 vehicles and it expects to increase this number materially. The estimated cost of operating a 750-pound wagon for 1600 miles a month with the service is $42.62, approximately 2.66 cents a mile.

Wise, Smith & Co., has this wagon and a 2000-pound machine in service, and has ordered two more of 1000 pounds capacity, which will make its delivery service four in all as soon as the vehicles are delivered.

PHILADELPHIA BATTERY EXHIBIT.

Special Attention Called to Construction of Grids and Increased Productiveness Made Possible.

At the recent New York electrical exhibition one of the interesting displays was made by the Philadelphia Storage Battery Company, Philadelphia, Penn., the builder of the well known "diamond grid" Philadelphia thin plate batteries. The "diamond grid" frame for the Philadelphia plates has remarkable strength and this construction affords unusual longevity, it is claimed, and it makes possible a lighter battery as well as decidedly increasing the capacity.

The company in all its exhibits demonstrates the construction of the grids and the increased productiveness as well as the decreased weight, by a series of sectional cells. Examination of the cells is invited and the qualities claimed for them can be established by repeated trials.

Besides this the company also displayed a series of batteries made for different types of vehicles of different makers, and the products designed for varying purposes.

A large electric vehicle garage is to be built the coming spring for C. Schmidt & Sons, brewer, 127 Edwards street, Philadelphia, Penn. This concern has now 19 machines in service and will, when the garage is built, have only electric wagons for delivery.

There will be no exhibition of electric vehicles at the New York pleasure automobile shows in January; it being the belief of the companies that have heretofore shown at these displays that it is not judicious to make exhibit where their products would necessarily be a small proportion of the total, and where they would not receive the desired attention unless departmentalized.

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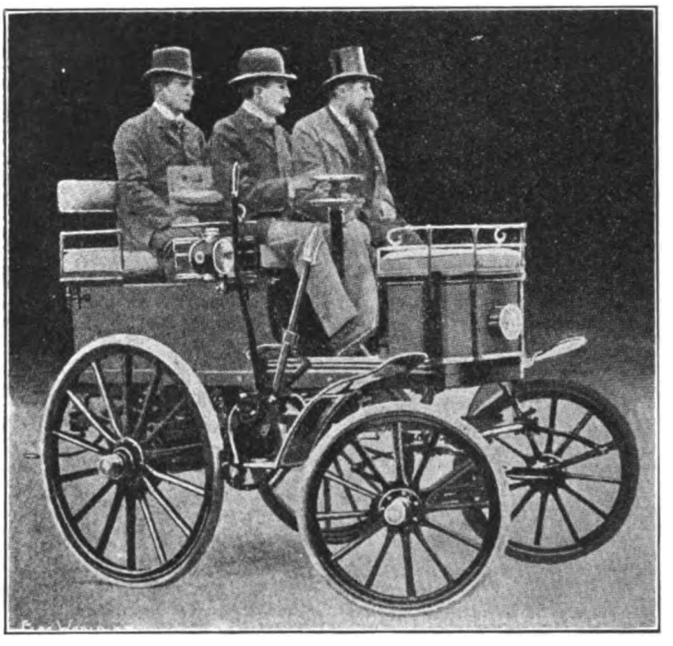
ELECTRIC VEHICLE PRACTISE.

Origin of Track Haulage Machines Driven by Primary and Storage Batteries and a Supplied Current---Experiments That Developed Practical Road Wagons and Mechanical Features of the Early Constructions.

By William W. Scott.

THE electric vehicle adapted for service requirements was first created in 1836 by Davenport, a resident of Brandon, Vt., who built a model locomotive that was operative on a miniature track. This was exhibited in London in 1838. In 1837 an Englishman named Sturgeon claimed that he had conceived the means for driving vehicles and boats by electromagnetism. Similar claims were made by an Italian named Betto about the same time. In 1839 Robert Davidson of Aberdeen, Scotland, construced a machine that would move two persons along a rough floor. The first railroad locomotive was built by Davidson and was tried in September, 1842, on a track between Edinburgh and Glasgow. The machine weighed five tons and moved approximately four miles an hour.

This creation was decidedly interesting mechanically, as the motors were suspended on the axles, the armatures being cylinders of wood into the surfaces of which were inserted two series, each of three longitudinal iron bars spaced 120 degrees apart. The magnet cores were built, the limbs hollow, and the windings were of wire with insulation of cloth. A commutator was fixed on the axle to direct the current into the magnet coils. The battery was composed of 59 elements, each made of a plate of amalgamated zinc between two plates of iron, 12 by 15 inches dimensions.



Patin Dog Cart, an Early French Machine of Distinctive Design.

In 1840 Uriah Clark built at Leicester, England, a battery weighing 60 pounds that was credited with driving a car on a track for 2.5 hours. Later the battery was increased in size and the machine drew several cars.

George Little, at Bristol, England, in 1844, built a peculiar motor that consisted of six radiating arms secured to the axle of one pair of wheels. On each of the arms was a bar parallel to the axle of the wheels that was magnetized. The current was supplied to the two magnets alternately and was cut off as the rotating magnets came opposite to them.

In 1847 Prof. Moses G. Farmer constructed and exhibited in this country a magnetic locomotive, equipped with a battery of 48 Grove cells, that pulled a car with two passengers on a track 15 inches wide. At Baltimore in 1850 a man named Page built an electro-magnetic locomotive that hauled a car and 12 passengers at a speed of 19 miles an hour on the tracks of the Washington & Baltimore railroad. At Boston in 1857 an inventor named Hall exhibited the model of an electric locomotive that was driven by power supplied from a battery through the rails. This was the first application of the central power station idea in the world.

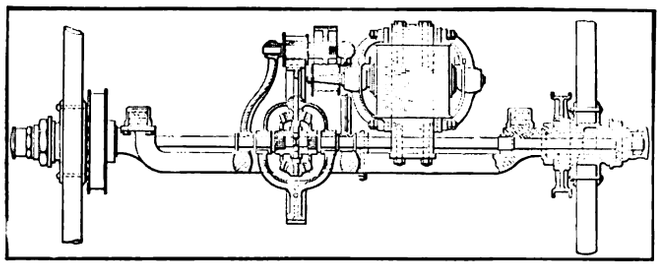
There were no developments of value from these constructions, however. It was in 1871 that Gramme discovered the reversibility of the dynamo electric generator—that it could be used for converting electrical energy into mechanical energy. Not until 1880 did Faure, a French electrical engineer, perfect the lead storage battery invented by Plante by coating the plates with lead oxide. Faure's invention was regarded as having commercial possibilities and a company was formed that used the Faure battery to supply the energy to drive cars on tracks with dynamo-electric motors.

Profs. Ayrton and Perry experimented with an electric tricycle in England in 1882, using a regular manual power machine from which the pedals were removed, one rear wheel being connected with spur gearing. The motor was suspended under the seat platform, fixed above the axle, and a pinion on the motor spindle was meshed with the spur wheel. A platform suspended from the axle and from the backbone of the machine carried the battery of Faure or Sillon-Volckmar cells. The motor weighed about 45 pounds and the battery about 100 pounds. The machine was not a commercial success.

In 1884 Andrew L. Riker made his first tricycle in this country, and in 1886 Radcliffe Ward built a cab

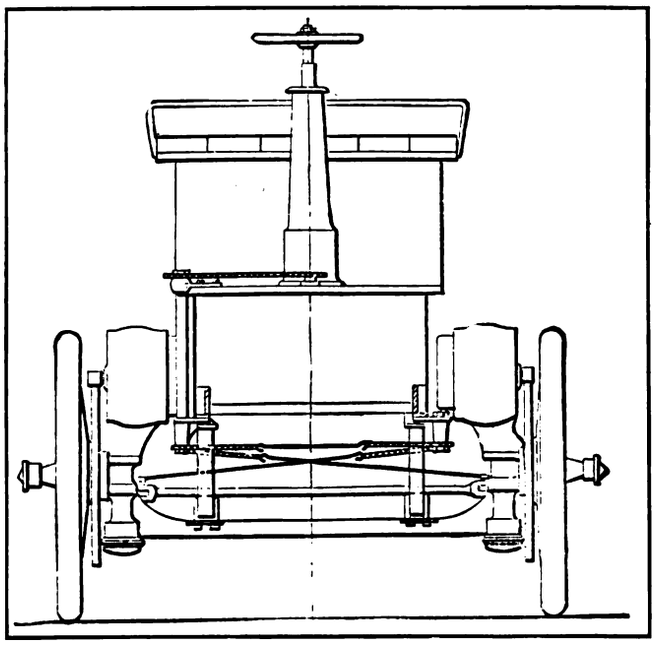
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that was tried at Brighton, England. This cab had a battery of 28 cells slung on a tray carried below the body of the vehicle, the motor was mounted under



The Patin Driving Gear, Which Afforded Two Ratios of Speed.

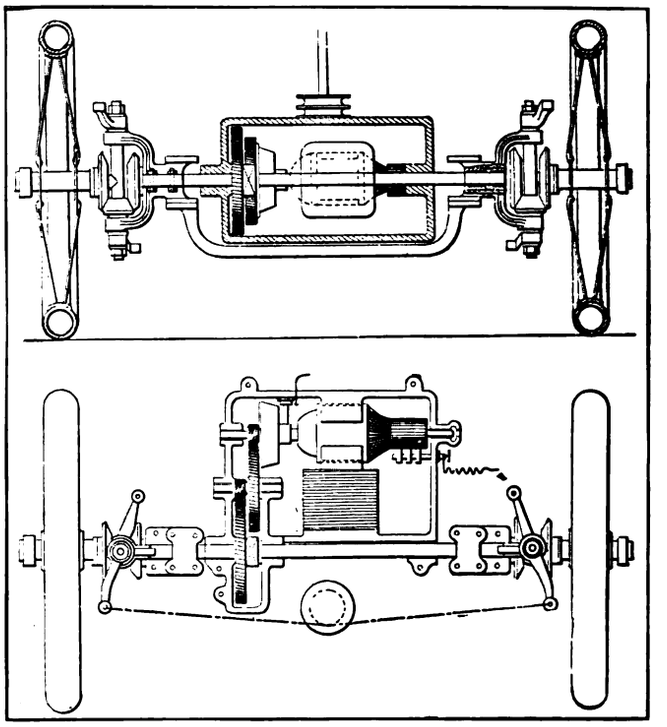
the driver's seat, and on the motor shaft were two friction pulleys, one half the size of the other, which were geared to two loose pulleys on an intermediate shaft. This intermediate shaft in turn drove the road wheels by a belt. Either of the two loose pulleys could be connected with a clutch. The weight of the vehicle was 2000 pounds and it had a speed of from seven to eight miles an hour. An electric omnibus, probably built by this firm, was used in London in 1888 and was driven more than 5000 miles. It had a speed of about seven miles an hour. This year the Kimball tricycle was built and used in America. Magnus Volk of the Brighton, England, Electric Railway, built in 1887 an electric dog cart that had as a source of energy a battery of 16 small cells located under the driver's seat. The motor was carried on hangers under the body and it drove one of the rear wheels by chain gearing and a countershaft. It was a small motor, rated at five horsepower, and the machine had a speed of nine miles an hour on asphalt and four miles an hour on macadam roads. Volk became associated with Immisch & Co., of London. He is credited with



The Krieger Coupe, Driven by Motors Fixed to the Front Wheel Pivots.

building the electric dog cart for the Sultan of Turkey, which was driven by a battery of 24 cells weighing 700 pounds and could be driven for five hours at a speed of 10 miles. The weight was about 1250 pounds. The machine was driven by chains to the rear wheels.

The electric runabout built for Fiske Warren of Boston by the Holtzer-Cabot Company in 1891 was the best production to that time and was decidedly an advance in design and construction. Pouchain, a French engineer, built a six-passenger phaeton in 1893, contemporary with the eight-passenger brake built by the Holtzer-Cabot Company for Mr. Warren. This was fitted with a battery of 54 elements of three plates each, composed of one Fulmen positive and two Dujardin negative plates. The capacity was 70 ampere-hours. The motor, a Rechnieuski type, was shunt wound, with a capacity of about 3500 watts, and had a normal speed of 1650 revolutions a minute. It was geared to the rear axle through an intermediate shaft and chain gears. The speed was varied by grouping



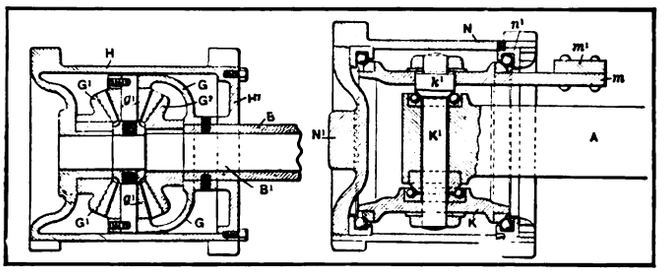
Cross Section and Plan View of the Jeantaub Driving Mechanism.

the battery cells and this was effected by rotating a cylinder which carried suitable contact pieces. The battery weighed 1100 pounds. The motor weighed 240 pounds and the vehicle 2500 pounds. This machine was contemporary with that built by W. H. Blood, Jr., at Kansas City, Mo.

Blumfield and Garrard built in France in 1894 a vehicle that was developed from the bicycle in that it had small wheels fitted with pneumatic tires and it had a variable speed gear. The body was mounted on spiral springs on a tubular frame and the 28-inch wheels were equipped with four-inch tires. The motor was suspended from the centre of the frame with the shaft lengthways of the body. On the shaft was a friction wheel or roller that engaged with a disc on an intermediate spindle, which was geared by a chain to the differential gear on the rear axle. The motor was

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driven at constant speed and to permit variations in the speed of the machine the shaft of the motor was made moveable lengthways, thus varying the radius



The Riker Hub Differential Gear and the Riker Pivoted Front Axle.

at which the friction wheel engaged with the disc and consequently the speed imparted to the disc. The battery was of 24 cells and was carried under the driver's seat and weighed 500 pounds. The current was estimated to be sufficient for 70 to 80 miles. The entire vehicle weighed about 1000 pounds, and during its trial made a speed of 10 miles an hour.

The possibilities of the electric storage battery were demonstrated to a limited extent in America by the use of the vehicles to which reference has been briefly made, and considering the construction of the batteries the machines were reasonably serviceable. The only batteries were of the Faure or Plante types and these were not only heavy, but were of decidedly small capacity, which was a condition to deter investigation and experiment, and to limit the development that might follow practical use. The demand for batteries was not large and this also militated against progression that would follow with more general use. In the experimentation with automobile vehicles it was found that the electrics were heavy, the capacity limited as to speed, mileage and number of passengers, and the places where the batteries could be charged were extremely few.

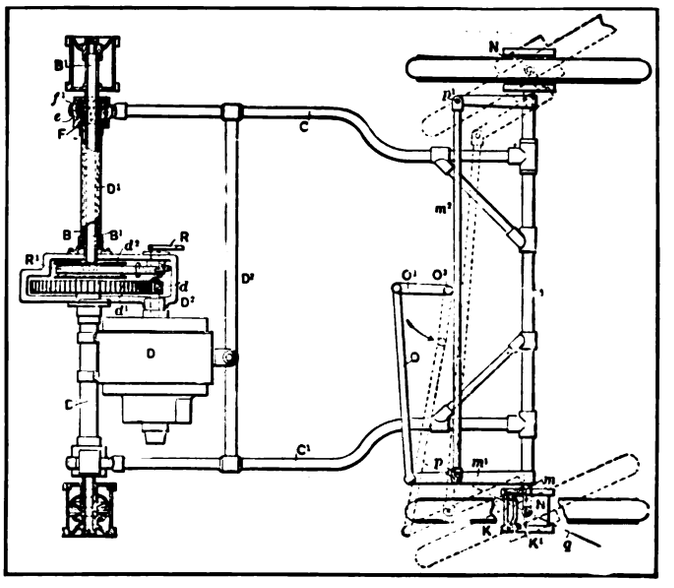
Despite these conditions attention was directed to electric wagons and carriages, and while there was no general assumption of industrial possibilities there were those who believed they might be utilized by those who preferred the silent running and easily maintained machines. There was a growing interest in the steam and gasoline engines as means of power for vehicles, and it may have been principle rather than possibility of business that impelled the few to continue the investigation of the electric. The Electric Storage Battery Company, Philadelphia, which was established in 1888, built batteries adapted for vehicles, and later on others engaged in this industry.

Of those who believed in the future of the electric carriage was Andrew L. Riker, whose work was largely carried on at Elizabethport, N. J., who was the head of the Riker Electric Vehicle Company. About the same time the Electric Vehicle Company was formed and established at Hartford, Conn. The American Bicycle Company gave some attention to the development of an electric carriage, and these were the three pioneers in manufacturing. The first Riker machine was marketed in 1897 and the same year the Electric Vehicle Company produced its initial carriage. The Columbia Company, Hartford, Conn., was the concern of the American Bicycle Company that tried the electric car, and in a short time the Indiana Bicycle Company, that built the Waverley bicycle, also began experiments with a carriage. This concern turned out its machine in 1898. The Baker Motor Vehicle Company at Cleveland tested a carriage for two years before it sold its first production in 1900. The same year the Babcock Electric Carriage Company marketed the first Babcock machine. There were numerous other companies that made exhaustive trials of machines.

Among the concerns well known at that time were the United States Automobile Company, Attleboro, Mass.; the General Electric Automobile Company, Philadelphia, Penn., and the American Electric Vehicle Company, New York City, and all of these, together with the Electric Vehicle Company, have ceased to exist.

The Electric Vehicle Company was established by a group of Philadelphia capitalists to manufacture pleasure machines. Later on this company purchased the Columbia Company's rights, and still later the the Selden patent covering the use of a clutch between the engine and the traction wheels of an automobile vehicle, and turned largely to the production of gasoline cars and wagons. It went eventually into the hands of a receiver, was reorganized as the Columbia Motor Car Company, and later became a subsidiary company of the United States Motor Company. At one time this company had a capitalization that very closely approximated $20,000,000.

The Riker Electric Vehicle Company and the Electric Vehicle Company began the manufacture of electric pleasure carriages, and shortly after turned to

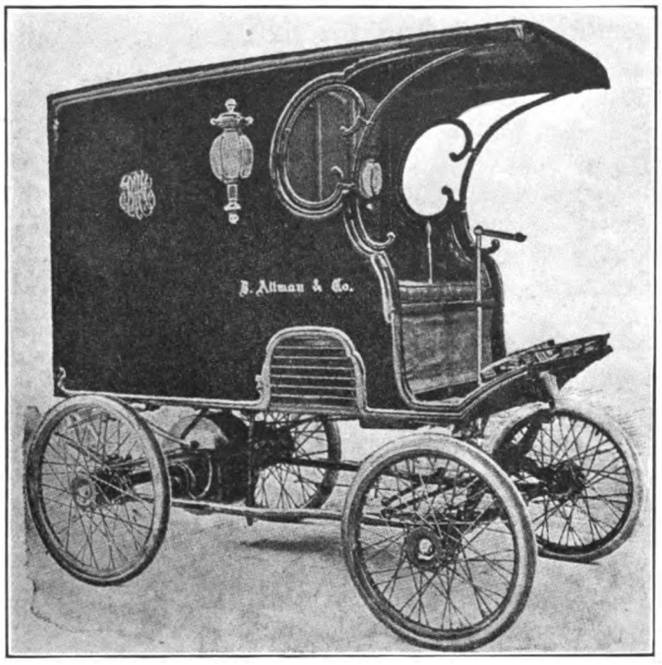


The Flexible Frame Characteristic of All Riker Vehicles.

the building of service wagons. The Electric Vehicle Company's original production was built with a tubular frame with fixed axles and was steered by individ-

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ually pivoted front wheels. The motor was suspended from the frame supporting the body, this being a single motor with a long armature shaft containing a differential gear. At the ends of the shaft were pinions that meshed with external gears attached to the hubs of the front wheels. The controller afforded forward speeds of three, six and 12 miles an hour and two reverse speeds. The battery consisted of 44 chloride cells with a capacity of 75 amperes at a three-hour rate and was rated as having a mileage of 35 over ordinary roads. The machine weighed about 2600 pounds. The wheels were of the wire type. The first Columbia delivery wagon was with the axles braced to the body by jack bolts, no reaches being used, and the motor, rated at 40 amperes, was hung just forward of the rear axle. The motor was protected by a cast iron housing that enclosed the differential gearing. The drive was by the pinions on the armature shaft meshing with external gears on the rear wheels. The battery of 44 cells was carried in a cradle or tray below the floor of the body, and gave a mileage of 25. The body was 48 by 72 by 42 inches and was designed to carry approximately 1000 pounds.



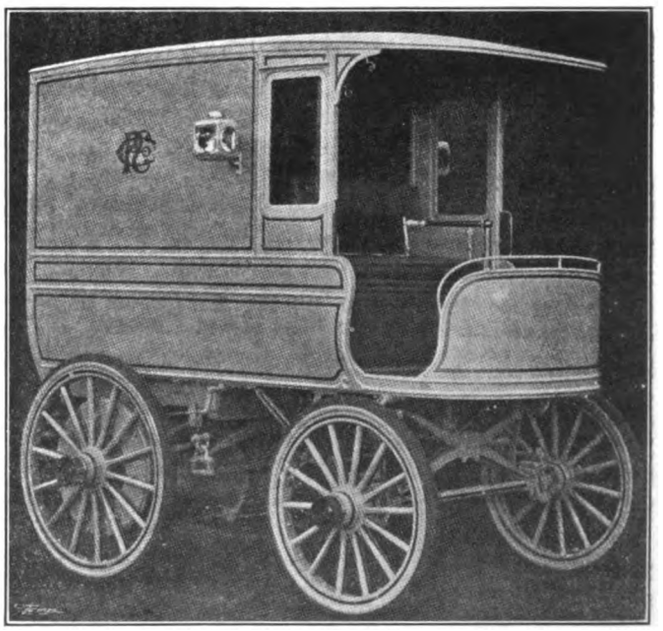
First Riker Delivery Wagon as Delivered to B. Altman & Co.

The Columbia machines were designed by Hiram Percy Maxim, who became connected with the Electric Vehicle Company after that concern absorbed the Columbia Company. The design stated was used for the light delivery wagons, but with the construction of heavier machines two motors were employed, these being geared to the rear wheels by spur gearing. After the consolidation the Electric Vehicle Company's machines were known as Columbias.

The Electric Vehicle Company built a large number of cabs and broughams, in which the axles were fixed and the forward wheels were driven by motors, the pinions of the armature shafts being meshed with internal spur gears attached to each wheel. The vehicles were steered by the rear wheels, the wheels being mounted on knuckles. It was found in practise that these could not be handled in the streets with the same ease as the machines steered by the front wheels. They could not be easily driven away from the curb after being placed close to it for passengers to alight, a condition that was keenly realized if a street were muddy or icy. These machines were also built with disc wheels having wooden rims.

The Riker Electric Vehicle Company's pleasure carriages were built with the Riker flexible frame, the Riker hub differential and the Riker pivoted front hubs, to which reference has already been made. The purpose of the flexible frame was to preserve the relation of the axles and to eliminate the distortion stresses. This construction proved to be very practical. The Riker patents were acquired for England by MacKenzie & Son and a number of the machines were built by that concern and used abroad. The delivery wagons and trucks were built with the same design so far as the frame and front hubs were concerned, but these were driven by two motors, which were geared by spur gearing to the rear wheels.

It is said that the gearing of the motors to the front wheels was the conception of a French designer, and so far as is known it was a construction first applied in France. The Bouquet, Garcin & Schivre carriages were driven by a single motor and a countershaft and chains and sprockets, and the Jenatzy machines, built by the Societe des Transports Automobil of France, was equipped with a shaft connected with the armature shaft by a universal joint, this shaft carrying two pinions meshing in gears keyed to the differential gear shaft that carried the driving sprockets.

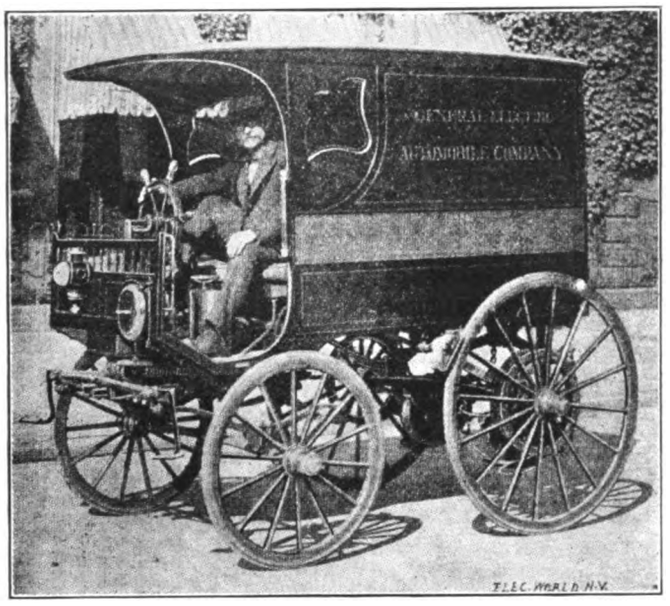


Early Type of Columbia Delivery Wagon of 1000 Pounds Capacity.

The pinions were of different sizes and a clutch betwen them engaged either at will so that there were two vehicle speeds possible

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with the clutches, and two others with the battery in parallel and in series. The Krieger electric, another French machine, was noteworthy from the installa-



Delivery Wagon Built by General Electric Automobile Company.

tion of the two driving motors on the pivots of the forward axle, so that they were turned with the wheels, and were geared direct by spur gears. The motors were four-pole, two poles shunt wound and two series wound, and when the vehicle descended hills the motors served as generators to charge the battery. The Jeantaud carriage, another French machine, employed a single motor with a countershaft and gearing driving a shaft carried in a dead rear axle in the ends of which were large yokes. On this shaft at either end was a bevel gear, which meshed with a bevel pinion mounted on the bases of the pivot pins, and these in turn engaged with other bevel gears fixed to sleeves secured to the hubs of the wheels. This construction gave a substitute for a differential and permitted the movement of the wheels for turning. The Patin vehicle, still another French device, had a complicated driving system with friction clutches by which speed variations were obtained.

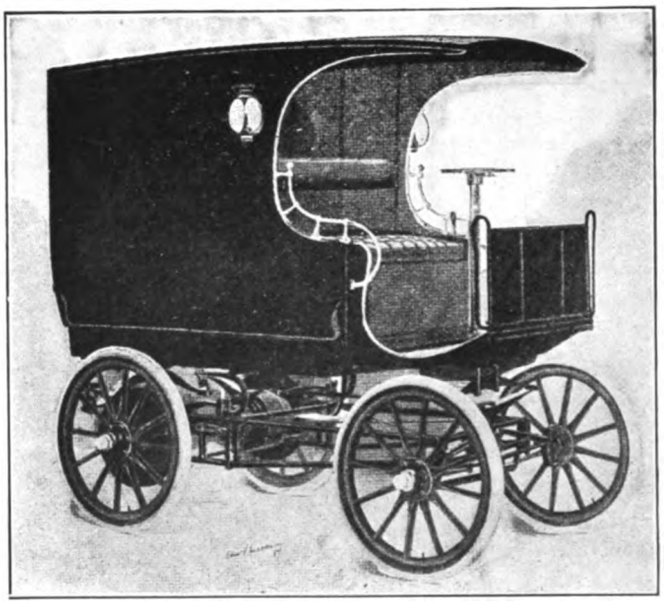
The United States Automobile Company's pleasure carriage was built with an underslung battery. The motor was mounted on the centre line of the rear shaft. No differential was used, but one rear wheel was connected to the revolving motor field and the other to the revolving armature, this affording the necessary flexibility. The battery was of 40 cells with a voltage of 80. The motor had a speed of 1000 revolutions a minute, and the vehicle had forward speeds of three, six and 12 miles, and reverse speeds of three and six miles. One battery charge gave a mileage of 30.

The General Electric Automobile Company's machines were driven by two motors suspended from the rear axle and from the vehicle body. On the armature shafts were pinions that engaged with annular gears fixed to the wheel spokes. The motors were of the four-pole type with the armature carried in roller bearings and rated at 80 volts, with the field windings in two coils, and it could be operated in series or multiple. The speed was 800 revolutions a minute. The pleasure vehicles were steered by the usual knuckle-jointed front axle, but with the delivery wagon the forward axle was turned as with the animal vehicle, by a hand wheel and a worm and segment. The battery was carried in a compartment under the body and on a spring suspended floor to prevent damage by road shocks.

The first Waverley vehicles were built largely on bicycle principles, with tubular frames and wire spoked wheels. The motor was of the multipolar type and was rigidly mounted on the running gear with the motor shaft geared directly to the two rear wheels. The differential gear was incorporated with the armature shaft. The delivery wagon was of the same construction with a battery rated at 125 amperes and of 44 cells. The radius was claimed to be 40 miles and the speed from eight to 12 miles an hour. These machines were fitted with wooden wheels and pneumatic tires. A lighter vehicle was fitted with a combination body, being convertible from a pleasure machine to one for light carrying.

The American Electric Vehicle Company's vehicles were fitted with motors having hollow armature shafts adapted to eliminate a differential gear. These machines were claimed to have unusual mileage.

The first experimental vehicle of the Baker Motor Vehicle Company was built with the motor housing forming the rear axle with the wheels mounted on the armature shaft, with which was incorporated the differential gear. The machines that were first sold in the market, however, were driven by a reduction chain



One of the First Delivery Wagons Built by Waverley Company.

from the sprocket on the motor shaft to the sprocket included with the differential assembly in the live rear axle.

(To Be Continued.)

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UTILITIES OF THE ELECTRIC VEHICLE.

Varying Services for Which These Machines Are Especially Adapted and in Which They Have Been Worked with Decided Success, Both for Long and Short Hauls.

THOSE who believe that the service for which electric vehicles may be utilized is limited should take the time to make observation and learn first hand that there is hardly a class of usage that might be conjectured in which these machines have not been well tried, and that there is not even a more general knowledge of the possibilities is due largely to the refusal of the public as a whole to seek information of a subject that is so vitally important.

There are those who will maintain that it is essential to have vehicles of large radius of movement, because it is very generally accepted that the long haul is the most profitable, although it may not be very generally known that the greater part of haulage is comparatively short distances. In discussing this subject it may be well to emphasize that no arbitrary point can be fixed where profit ceases and loss is experienced in any haulage proposition, simply because each instance differs, and it is not practical to determine that any given mileage is the limitation. By this is meant that it is impossible to apply a rule, and each case must be worked out with reference to innumerable factors.

It is reasonably certain, however, that several elements must be regarded in transportation problems, and the most important of these is whether or not economy of time or economy of expense is the object sought. In the one case, where time is a factor, it may be profitable to carry a load a long distance by the fastest form of vehicle, while if cost alone were the main consideration the shipment could possibly be made by a much slower and less expensive transport, as by freight, for instance. This may be the better understood if one compares the express and freight services of the country, with which all are reasonably familiar. With the former one pays for speed and delivery; with the latter one sacrifices time and pays less.

But it is obvious enough that all do not send commodities by express. The cost is prohibitive, and so for every pound sent by express it is probable that tons are shipped by freight. Not only this, business arrangements are made with an understanding of conditions and these are accepted for obvious reasons. In applying this to motor vehicles it may be necessary to explain that great speed and very rapid haulage is not ordinarily required or expected. Special delivery costs money, no matter in what form, and it is seldom indeed that there would be necessity of extreme mileage capacity, which some affect to believe. Assume for a moment that a vehicle of five tons capacity has a speed of 12 miles an hour, and this would mean a possible mileage of 120 if operated continuously at maximum speed for 10 hours a day. It is extremely improbable that this machine would be driven at an average of more than 40 miles daily, which is but a third of that which it could accomplish. The actual running time is three hours and 20 minutes at top speed, or five hours at two-thirds speed, or possibly eight hours at five miles an hour. But as 40 miles is probably an outside figure, it will be found by close observation that maximum speed is seldom realized when loaded, and that equally good progress could be made with a machine with a smaller power plant and the consequent economy, and a lesser radius of movement. This applies to average work and not to specific cases where an extreme mileage might be desirable.

Taking the electric vehicle of today it will be found that the battery capacity of the lighter types will range from 45 to 54 miles, manufacturer's ratings, and that the five-ton trucks are rated at 35 miles. As all electric mileages are based on carrying a load half the dis-



Some of the Fleet of Six Electric Wagons in the Service of the Lincoln Safe Deposit Company, New York City.

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Electric Ambulance of the Mount Sinai Hospital, New York City, in Service Since 1902—Photo Copyrighted by the New York Edison Company, 1912.

tance, with a reasonable margin in excess of the limit, a moment's reflection will convince one that at 12 miles an hour for the smaller machines and seven for the larger, the actual running time provided for at maximum speed is from four to five hours. But it is also apparent that it would be impossible to drive at this rate through streets and traffic, and that practically, at least, the running time is extended another hour in actual work.

What applies to the electric can be applied to any other form of machine, and it may be said that in starting and stopping in congested streets the electric has the quality of exceptionally easy control and comparatively quick movement. That is to say that it ought to be faster in crowded highways than other vehicles. In work in the cities the electric wagon or truck then has sufficient speed and mileage capacity, can carry a load up to its rated limit, and where the work is within its radius it can be depended upon for practical and consistent service. The probabilities are that the average haul in most cities, without excepting New York or Chicago, is not more than three miles, but of course there is work where it is necessary to traverse routes that may reach 35. Everything depends upon the requirements. There will be extremes in all cases and yet the average may be relatively small. When the service of trucks is under consideration it must be remembered that with animals from 12 to 20 miles daily was looked upon as limitations, half of the distance without load, and the vehicle capacities are not as a rule as large with horses as with power wagons. With 20 miles as the maximum it will be understood that the average was decidedly less, and this being so it is difficult to understand why it is that extreme mileage capacity is to be sought when it cannot be utilized but a very small part of the time the vehicle is in service. Not only this, but it is also a fact that demands for haulage have not been for increased mileage only. There is, assumedly, the same volume of haulage for the shorter distance that always existed. In fact the probabilities are that there are even more short hauls.

The utilization of the electric vehicle in all forms of haulage is surprising to those who are well informed. The uses found for machines of this types are indeed numerous, and it may be said that each day they are found to be practical in work for which it is generally believed that they are not especially adapted. Of course there is the possibility of doubling the mileage by changing the batteries, and it is practical to work them almost constantly by shifting the crews and the source of current supply. Probably one of the best illustrations of what may be done is afforded by a large brewer of New York, whose machines are frequently driven from 70 to 80 miles daily when business requires, and with spare batteries he is ready for any exigency that may arise.

The same service is secured by a man who operates a parcel delivery business in Hartford, Conn., who has been able to work his electric wagon for practically double the number of hours when demands necessitated. He maintains that he is in business to make money and he finds that it is economical to make the change of batteries and have what is practically as much to him as two vehicles. He is so situated that he can extend his work over a somewhat longer pe-



The Latest Electric Ambulance in New York, the Property of the Rockefeller Institute—Photo Copyrighted by the New York Edison Company, 1912.

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Raising a 40-Ton Light Pole with the Power Winch Installed on a Five-Ton Electric Truck—An Example of Construction Work—Photo Copyrighted by the New York Edison Company, 1912.

riod of hours than might be possible with others, and he has adapted his methods to the capacity of his vehicle.

Taking the electric machine from every point of view it may be said that it is utilized in all forms of transportation and in innumerable work. It has been found to be especially adapted for delivery work because it is so economical and it requires so little attention. One of the conditions that has deterred business men from more generally using them has been the lack of garages where specialized attention could be given, but this has been met in numerous instances by the manufacturers establishing branches where electric garaging facilities can be obtained at reasonable cost, and agents have in numerous instances opened stations in connection with their agencies for the benefit of their customers and others generally. There are, in some of the larger cities, exclusive electric garages, and there are some stations which give attention to industrial vehicles only. There are very few of the last mentioned class up to the present time, but it is extremely probable that the number will be multiplied very rapidly.

It may be pointed out that where delivery systems are of large proportions the electric wagon and truck often forms a considerable part of the equipment, and this is especially true of the large cities, as in New York, Chicago, and similar commercial centres, and these are operated generally from garages that have been constructed and equipped with the best of facilities for maintenance and care. Probably no better examples could be pointed out than B. Altman & Co., R. H. Macy & Co., Arnold, Constable & Co., Gimbel Brothers, John Wanamaker, Carson, Pirie, Scott & Co., and firms of similar character in New York, Philadelphia and Chicago, which have requirements necessarily exacting and entailing services that must be absolutely reliable.

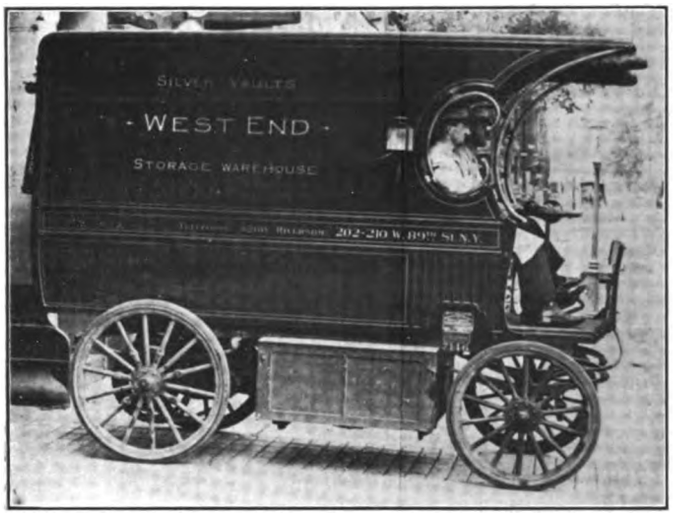
It is also a fact that these firms have increased their installations after a sufficient experience to demonstrate the practicability of electrics, and have established the electric divisions as sufficiently economical and dependable to justify a continuance. Obviously, as knowledge of these machines has increased the better results have been obtained, and as these services are operated by carefully developed systems the records show precisely what has been accomplished as well as indicating possibilities with perfected operation.

The requirements of the large express companies are also exacting. A large part of the business transacted is the haulage of packages of differing sizes, and generally delivery is made on routes with regular or special calls as the service may demand. Necessarily the installations must not be larger than are sufficient to colect and deliver the packages, and yet there must be a considerable degree of elasticity as there are times when the volume of haulage may be increased very largely. This variance compelled the maintenance of a reserve of animals and wagons when



Atlantic 3.5-Ton Truck, Loaded with Metal, That Is Utilized for Heavy Haulage.

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Studebaker Wagon Used for the Transfer of Silver, Rugs, Furs and Other Costly Property.

horses were used, and of course an expense that has been eliminated with the use of motor vehicles. Under any circumstances there is only need of additional men, for the machines may be used as much of the time as is necessary, and the experience with electrics has been that they have abundant mileage capacity for the average service without change of batteries. Of course where the needs are extreme, the batteries may be "boosted" and additional trips made, and as there are numerous stations in New York and perhaps other cities where supplementary charging is possible, it will be understood that the probabilities of delay from battery exhaustion are small.

Where the haulage is extreme and the speed desired is fast there are conditions where the gasoline vehicle would give the better service, but if the installations of the express companies are to be regarded as criterions these are the exception and not the average. Where the deliveries are to be made long distances from the central receiving point it is far more practical to have transfer made by vehicles of large capacity, and to establish distributing stations from which the faster and lighter wagons can be sent out. This system is used with a number of the department stores of New York and Chicago, and the result has been a material reduction of dead mileage and a decided expedition of the delivery of the concern.

From the experience with the transfer haulage and distribution system there is much to commend it, and it would appear that this will eventually become the vogue with the majority of the large concerns, but it is impracticable to endeavor to adapt this to the small business, where the deliveries are frequently wide apart and in a large area. Where the volume of haulage is comparatively small and the service corresponds it is quite as essential to route the trips and economize the mileage as with the work of the express company or the mammoth department store. It may be said the success of business depends in no small measure upon the care taken to make deliveries with the least cost possible. Accommodation may at times justify additional expense, but promotion of custom is always to be advocated, and for either purpose the motor vehicle has undoubted capacity.

Where the light delivery wagon may be utilized to good advantage is in service where the loads carried are small, regular stops and variable deliveries are made, and large mileage is covered. Such work is performed with the fleet of Waverley 600 and 1000-pound wagons operated from the New York City headquarters of the Fleischmann Company, which distributes yeast in the metropolis and its suburbs, and to customers whose places of business are routed carefully. It is essential with this work that the machines be driven so far as possible to a schedule and as the business transacted is constant there is but little need of reserve or elasticity of the service.

In direct contrast with the examples that have been stated is the work required of the Lincoln Safety Deposit Company, which maintains a fleet of six General Vehicle wagons and trucks in the haulage of property that is to be placed in its vaults for safe keeping or is delivered at the homes of the owners. Orders are received and the property handled as desired, but it will be apparent that the work is not only variable, but the calls are infrequent, this class of service entailing extreme care to obtain the greatest economy. Occasionally it is necessary to take property out of the city and runs of 35 miles or more have been made in a short time. For instance a load was taken to Stamford, Conn., and delivered, this distance being approximately 35 miles. The run was made in 4.5 hours and the truck remained over night, making the return the following day. There was no hesitancy in making the trip, although the load was taken the entire capacity mileage instead of half, the usual rating of the vehicle. It is evident that the transportation system of this company is more costly to maintain than were the work constant, but this would apply no matter what the conveyance used.

A similar class of variable work is required by the



Sixteen-Passenger Omnibus, One of the Latest Productions of the General Motors Truck Company.

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One of a Fleet of 29 Waverley Light Delivery Wagons Used by the Fleischmann Company, New York City.

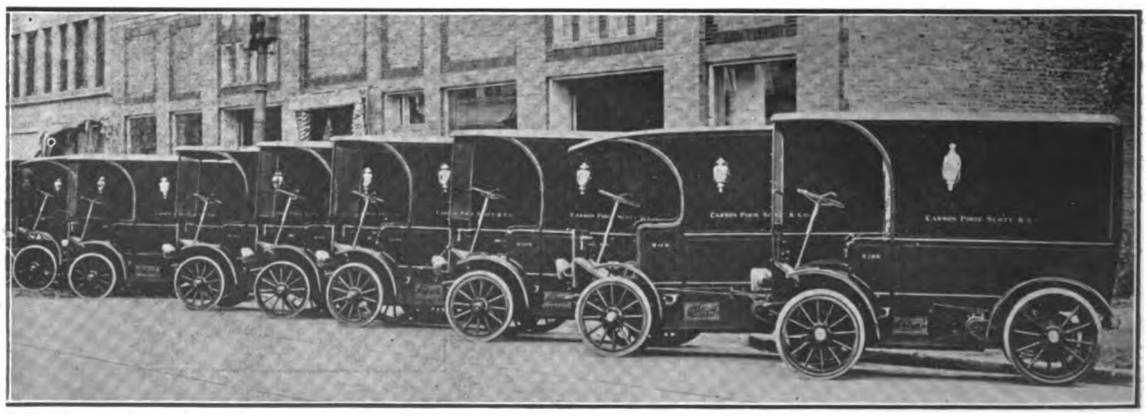
hospitals of New York, as the ambulances are dispatched wherever needed, and the calls may be frequent or occasional, but it is imperative that they always be in readiness. The oldest electric ambulance in New York is the property of the Mount Sinai Hospital, this being a General Vehicle machine that has been in use since 1902, and it still operating well, it making an average of 400 calls annually. The latest form of ambulance is the Detroit electric that was recently added to the service of the Rockefeller Institute, and which is required to make a large mileage. Both have been found extremely practical, being decidedly comfortable for the unfortunates transported in them, being easy to control when driven rapidly over all forms of highways and through heavy traffic, and having the endurance that is necessary to insure constant operation.

Still another class of work is that entailed with the business of the West End Storage & Warehouse Company, which has utilized motor vehicles since 1901, when it placed in service the first electric truck used in commercial work, this being a two-ton General Vehicle machine. The haulage is in every way variable and there is at times demand for work that could not well be accomplished without vehicles having a large reserve. Two years since this company replaced the original electric machine with a new wagon of the same make, and later on added a one-ton Studebaker wagon, that is used principally for transporting goods that are placed in the vaults and are as a rule costly. Similar service is given the Columbia Storage warehouse by a Lansden van and two gasoline machines of Walters make, and the Manhattan Storage & Warehouse Company, although doing much of its work with animals, has installed a Studebaker electric van that is utilized for special work.

The Globe Storage & Cleaning Company employs two Lansden vans for the collection and distribution of carpets, it making a specialty of renovating carpets and rugs, and in Brooklyn the Eagle Storage & Warehouse Company has a General Vehicle electric wagon that is used for the transportation of rugs and silver, employing gasoline machines for hauling furniture. The Long Island Storage Warehouse Company in Brooklyn also has two electric wagons and two gasoline vehicles engaged in its haulage, and the Pioneer Warehouse uses a Lansden electric machine.

In construction work motor vehicles have been used with a very large measure of success, but to the best advantage where it is possible to facilitate loading and unloading. In many instances a large measure of satisfaction has been obtained by the equipment of the machines with special appliances for hoisting and the like, and in differing work it is possible to utilize these portable facilities with much economy. While animal apparatus could be used advantageously, slow transportation and the need of adaptation to meet each individual requirement has been the occasion of considerable additional cost. An illustration of possibilities is given in which a 40-foot lighting pole is being erected in New York City, the iron column being hoisted into position by a power winch carried as regular equipment on the truck. Another example is shown in the use of an Atlantic 3.5-ton truck for the haulage of structural metal, this being a work in which the machine was economical and reliable.

In the transportation of passengers the wagon chassis have been equipped with bodies accommodating from 12 to 20, and these have been driven in regular and irregular service with very satisfactory results. The General Motors Truck Company, Electric Division, has recently produced a machine that is to be standardized as a type and will no doubt meet the requirements of those who desire commodious, serviceable and economical machines. This has a capacity of 16 passengers and it is suited for all manner of public service, being particularly adapted for city traffic.



Some of the Detroit Light Delivery Electric Wagons in the Service of the Carson, Pirie, Scott Company, Chicago, Ill.

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PRACTICAL ELECTRIC GARAGE SERVICE.

Successful Business Developed by Memphis Concern, Caring for Pleasure and Commercial Vehicles.

An example of the possibilities by practically stimulating electric vehicle use may be found in the experience of the Memphis, Tenn., Consolidated Gas & Electric Company, which conducts a garage in its own name and under its direction for the exclusive care and maintenance of electric machines. In that city until a year ago there was no station where owners of electrics could receive the attention that was demanded by those owning other automobiles. In Memphis were a number of electrics, mostly pleasure cars, desirable by women because of their cleanliness and noiselessness and ease of handling, but which were not well maintained as a rule because of lack of facilities.

The company opened a garage and announced its purpose to give good service, and established prices as follows: Full service, a month, $25; full service less delivery, a month, $20; vehicle care and oiling, a month, $10; battery care, a month, $7.50; wagons, 1000 to 3000 pounds, full service, a month, $20; charging energy on above contracts, a kilowatt-hour, five cents; charging energy (no contract, $1 minimum), a kilowatt-hour, 10 cents; dead storage, a month, $7.50; wet storage, a month, $12.50; single washing, day, $1; single washing, night, 75 cents; battery and car labor, an hour, 75 cents; single call or delivery, 25 cents.

The original garage floor space was 6500 square feet and eight months after the station was opened it was necessary to increase it to 11,500 square feet. Now its customers include 11 service wagons, nine of which have been placed in service since the opening of the garage, and 34 pleasure cars, a total of 45. The station has 26 charging plugs and its average use of energy is more than 600 kilowatt-hours. The company has advertised the service and guarantees good workmanship and attention.

Electric Truck in Electric Service—The electrical commissioners of South Norwalk, Conn., have given an order to the General Vehicle Company, Long Island City, N. Y., for a G. V. electric truck. The vehicle will be fitted with every device to make it applicable to the work intended, and electric lights will illuminate the interior during night hours. The truck can be charged at the electric light plant without any material cost to the town.

The dealers' announcement of the Waverley Company, Indianapolis, Ind., recently issued, is in the form of a booklet of 16 pages, 11 by 16 inches, handsomely illustrated with three and four color plates, in which every product of the company is represented. The service wagons range from the 1000-pound delivery machine to the five-ton truck. Aside from the pictorial attractions the booklet is of unusual interest from the forcible selling talk it reflects.

NEW GENERAL VEHICLE FACTORY.

Three Additional Structures Needed to Take Care of Increased Demand for Its Product.

The work preliminary to the erection of the new factory buildings of the General Vehicle Company at Long Island City, N. Y., is progressing rapidly, and it is expected that the construction will shortly be begun. The additions to the plant will include three buildings and the arrangement will be with these on three sides of a quadrangle. One of the structures, the principal building, will be 700 feet length and 250 feet width, and another will be seven stories in height. The foundations are built on concrete piling and on these the steel and concrete walls will be raised.

The equipment of the new factories will be the best that mechanical skill can produce and the machines will be driven by electricity, there being an individual motor planned for each machine. As the wagons and trucks are standardized the parts will be interchangeable and made of the highest grade materials. A considerable part of the plant will be given over to the building of the trucks under the Mercedes rights. The factory has been so pressed with the electric truck orders that a temporary building has been erected for assembling, and this will be utilized until the permanent structures are ready for use.

ELECTRIC VEHICLE ASSOCIATION.

Interests in the Metropolis Inaugurate Activities Which Should Promote Use of Service Machines.

The New York Electric Vehicle Association has inaugurated activities that ought to be extremely stimulative of the use of electric vehicles of all kinds in the metropolis and vicinity, especially with reference to service machines. The directors at the last meeting of that body elected Henry C. Fling secretary and Harvey Robinson treasurer, and arranged for the preparation of publicity matter by A. H. Miller, who is well known and qualified for this work. New York now has nearly 2000 electric machines in use and the association hopes to increase the number materially.

Committees were appointed which will direct the promotive endeavors of the association with reference to charging stations, the proposed co-operative garage, traffic and service runs, operating costs, publicity and membership, and it is proposed to have these works of a character that will be in every way beneficial.

One subject in which the association is especially concerned is the establishment of a system of charging posts or stations for the suburbs of New York, and it is expected that the association will shortly authorize the publication of a book of road maps and other information that will benefit the electric vehicle owners and users.

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The MOTOR TRUCK
Devoted to Motor Driven Business Vehicles of All Classes.

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Anonymous communications not considered. Correspondence on subjects relating to trucks, delivery wagons, taxicabs, tractors, all motor driven farm, fire and municipal apparatus, the motor industry and the trade, will receive attention. Stamps must be enclosed to insure return of unsolicited contributions.
Entered as second class matter, February 25, 1911, at the Postoffice at Pawtucket, R. I., under the Act of March 3rd, 1879.

REGARDING PARCELS POST.

By the provisions of the act of Congress approved Aug. 24, 1912, the Postmaster-General must prepare such special equipment—sacks, stamps, maps, etc.—as is necessary for the inauguration of a parcels post system before Jan. 1, 1913. The act carries with it an appropriation of $750,000, with which all this equipment must be purchased and all provisions made for the delivery of this new mail matter.

That eventually the parcels post system will be placed upon a motor truck basis is probable. Virtually, the government will take over at least a portion of the business heretofore done by the various express companies, and it is to be presumed that the postoffice officials will profit by the experience of their predecessors in the administration of this business. The express companies have been adding mechanical transports to their equipment very rapidly during the past year.

But the federal government is not in a position to purchase the necessary motor trucks at this time. In the first place, $750,000 would not go far toward equipping the entire country with such vehicles. In addition, the postoffice department has not yet formulated a plan and has no possible means of knowing the volume of business it will be called upon to handle.

Under the present arrangement with the express companies, parcels to be shipped by express are called for at the home of the sender, if desired. Parcels to be mailed under the international parcels post system must be delivered at the postoffice by the sender. Which plan will be adopted by the government for the new domestic parcels post system?

Express companies decline to make delivery of parcels except within a certain radius from the receiving office. The postoffice department must extend the benefits of free delivery to the parcels post system, but it does not yet appear whether the regular city and rural carriers will be called upon to assume the added burden, or special carriers are to be appointed for this particular branch.

All these things must be worked out, and it is not improbable that teams and drivers will be hired, or that this delivery will be let out on contract under somewhat the same plan as is now followed by the so-called star routes. In either event the actual carrier would prove a prospective purchaser rather than the government.

There is no mistaking the fact that the parcels post system is to open a splendid field for the motor truck salesman, but that it is to interfere seriously with the business of the industry is hardly probable. The business man who has decided upon the purchase of an industrial transport may give his order without fear of its being held up pending the filling of any enormous contract with the United States government. In the meantime, the manufacturer would do well to cultivate this new field, because it will prove the means of developing a demand that will be far-reaching in its effect upon the industry.

THE MASSACHUSETTS SITUATION.

It will be remembered that a bill limiting the weight of motor trucks used on the public highways was introduced into the Massachusetts legislature at its last session. After some little discussion and several hearings the propositions was passed along to the legislature of 1913. Evidently there is no disposition on the part of its originators to permit it to be forgotten.

The same reasons which were advanced against its passage in 1912 have equal force at this time. It appears to be a question as to whether the various towns in the commonwealth shall put their bridges in proper condition to accommodate the modern form of transportation or the development of the industry shall be hampered by restrictions which cannot help but retard the purchase and use of mechanical conveyances.

The industry should see that the matter is placed in the proper light before the incoming legislature, as the decision rendered in Massachusetts is liable to have an important bearing upon future legislation in other states.

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WHITE PROTECTIVE WAGON.

Details of the Latest Equipment Placed in Service by the Department in Boston.

The Boston Protective Department, which has charge of the protection of goods from water during fires in the metropolitan district of Boston, recently placed a White car, made by the White Company, Cleveland, O., in service after subjecting it to an exhaustive test, particularly with reference to its hill climbing ability.

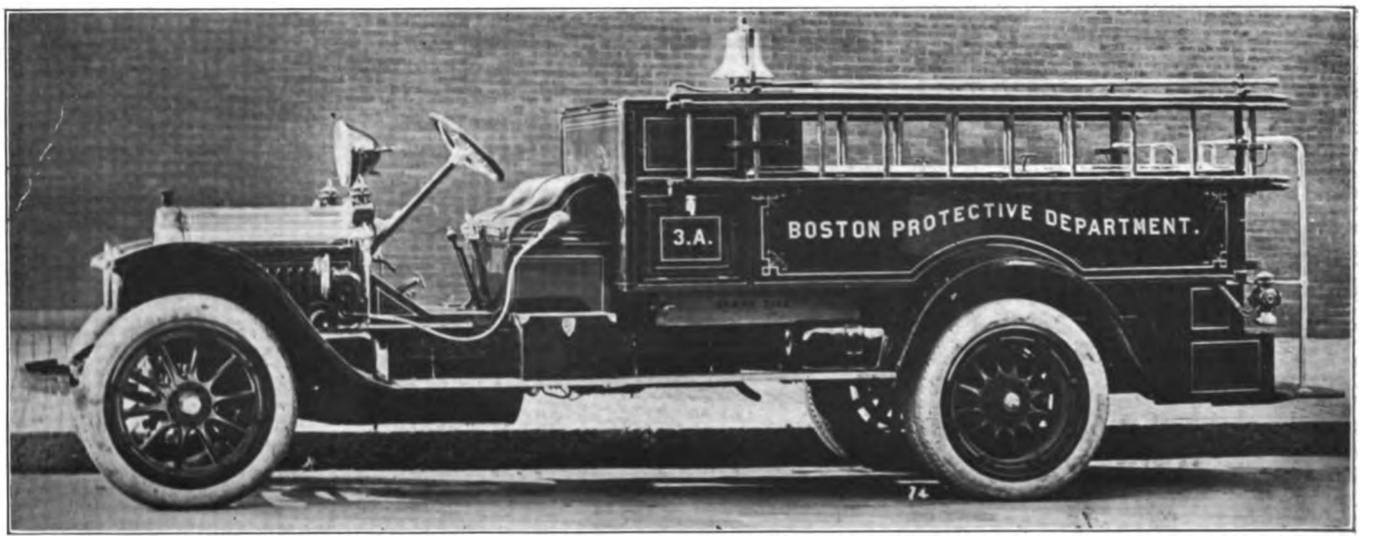
The chassis is a regulation 1.5-ton White, the four-cylinder block motor having bore of 3.75 inches and stroke of 5.125. Intake, exhaust and water manifolds are cast integral, and the valves are all on one side. Cooling is by water, a centrifugal pump being employed. The honeycomb radiator is so supported that it does not receive the strain to which the frame may be subjected on rough roads. Lubrication is by a combined forced feed and splash system which has proven very satisfactory in service. Ignition is by high-tension magneto.

The clutch is a leather faced cone member. The transmission is of the selective type, providing four speeds forward and reverse with direct drive on the third gear. Drive is by shaft to the rear axle, this being fitted with two universal and one telescopic joints. Two sets of brakes are fitted, both acting on large drums of wide diameter on the rear wheels. That actuated by foot is external contracting, fibre lined, and the hand operated members are internal expanding.

The frame is of heat treated crucible, chrome nickel steel. Springs are semi-elliptic front and rear. The front axle is a one-piece drop forging of I beam section, and the rear comprises three members—gearcase, right and left axle sleeves, supported by a heavy truss. All gears are accessible through a large cover on the housing, and are removable without splitting the gearcase. The wheelbase is 144 inches and the tread 56. Tires are 37 by five inches, all around, with dual members in the rear. Demountable rims are employed.

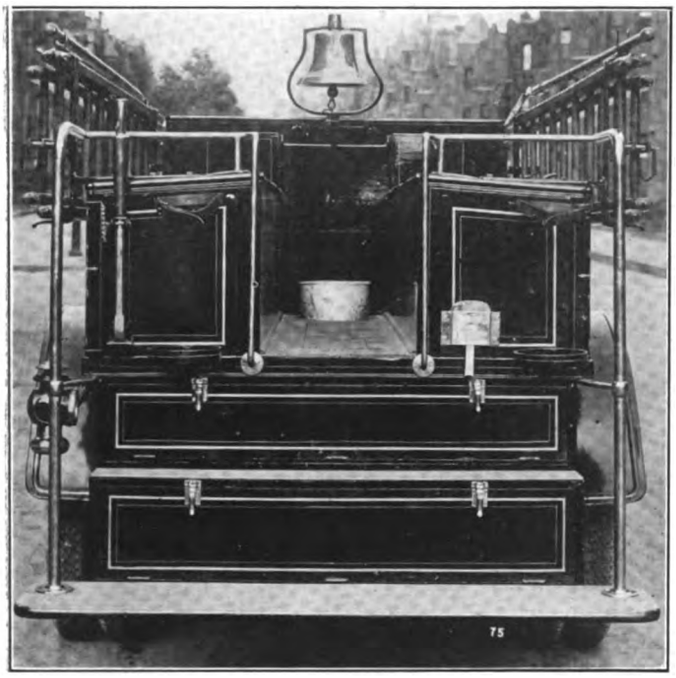
As will be noted, the driver is placed at the left with centre control levers. The lamps are lighted by electricity and the White electric motor starter is another valuable feature, in view of the necessity for quick action when the machine is called on an alarm.

Under the seats on either side in the rear are carried 28 large water proof covers, which the crew of four to six men spreads over house furnishings or merchandise in stores to protect them from water. In the box placed crosswise just back of the driver's seat, the door of which has the mark "3 A" upon it, are stored door openers, crow bars, axes, shovels, brooms and a battering ram. Above that, in another compartment, are ropes, lamps, etc. At the extreme rear are two



White 1.5-Ton Truck Recently Placed in Service by the Boston Protective Department for Carrying Protective Covers for Use in Case of Fire.

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Rear View of Boston's Protective Wagon on White Chassis.

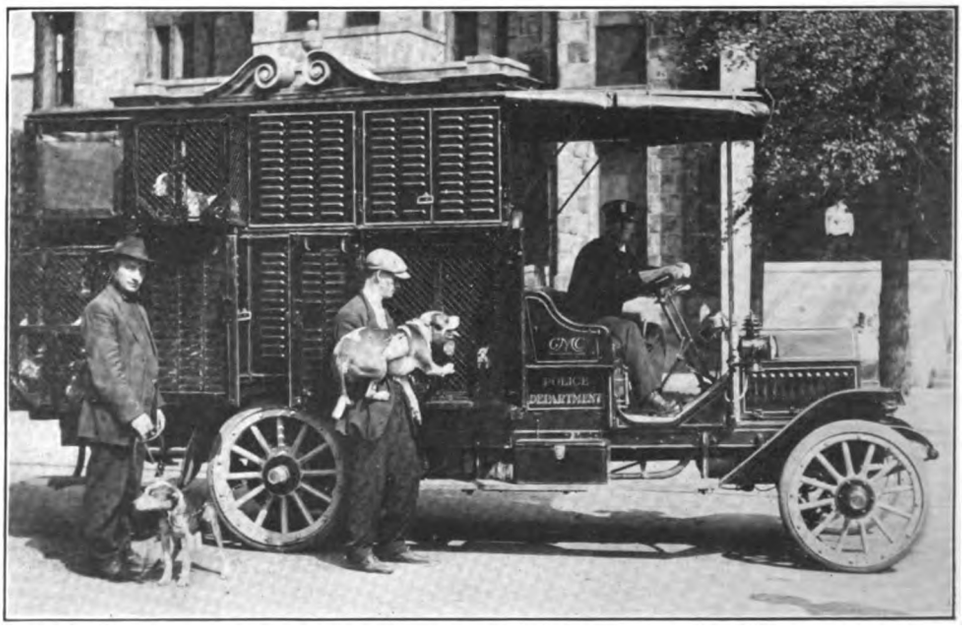
compartments, in the lower one of which, on a level with the bottom step, is the life net box, and in the one just above it, "squillgees" for pushing water off the floors. The normal load weighs about 3200 pounds.

G. M. C. DOG CATCHER'S WAGON.

Novel Addition to the Motor Equipment of the Police Department in Detroit.

It is not at all surprising that the city of Detroit should utilize motor equipment, wherever possible, but it would seem that the officials in the heart of the industry turn to the manufacturers of automobiles for the solution of very nearly every problem which presents itself. It is possible that other municipalities make use of a motor car in riding the city of unlicensed dogs, but it is safe to assume that none has a more pretentious vehicle than the police department of Detroit, a photograph of which is reproduced herewith.

The car is a G. M. C. gasoline wagon, made by the General Motors Truck Company, Pontiac, Mich., and is designed to take care of the dogs in the most humane manner. Fourteen cages of differing sizes are provided, making it possible to keep a particularly vicious dog from the others when this becomes necessary. Each cage is removable and equipped with a water pan especially designed for the purpose. Since it was placed in service this G. M. C. has impounded an average of 90 muzzleless canines a day.



G. M. C. Dog Catchers' Wagon in Service with the Detroit Police Department.

ADAMS FIRE APPARATUS.

Latest Type of Vehicle Produced for the Department in Kittanning, Penn.

An accompanying illustration presents the hose wagon recently completed by the Adams Bros. Company, Findlay, O., for the fire department in Kittanning, Penn. The body is mounted on the regulation 1.5-ton chassis made by this concern, and the vehicle is capable of a speed of 30 miles an hour.

The motor is a four-cylinder unit, with bore of 3.875 inches and stroke of five, cast en bloc and with ample water circulation between each cylinder. The rated horsepower is 30. The inlet and exhaust valves are located on the right hand side of the motor, and are mechanically operated. Lubrication is by a combined force feed and splash system. Ignition is by high-tension magneto.

The clutch is a multiple disc, and the transmission is of the selective type, affording three speeds forward and reverse. Two service brakes are fitted to the jackshaft, being operated by pedal, and two emergency members on the rear wheels are actuated by hand lever. The driver is located on the right with right hand control. Solid tires are employed, 36 by 3.5 inches in front and 36 by three, dual, in the rear. The wheelbase is 136 inches.

The fire equipment includes: Two extension ladders, two six-gallon Babcock hand extinguishers, two crow bars, two fire axes, two hand lanterns, wire basket, two electric and oil dash lamps and one tail lamp, 12-inch searchlight and Prest-O-Lite tank, 10-inch locomotive bell and locomotive exhaust whistle. The

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body is painted pure white with gold stripings, and all metal parts are brass finished.

MOTORS FOR GARBAGE COLLECTION.

New York Decides to Install Several After Experimenting for the Past Year.

While several European cities have obtained very satisfactory results in the utilization of motor vehicles in the collection of garbage, the officials of New York City were not convinced of the practicability of this plan until recently. It will be remembered that Street Commissioner William Edwards hired a number of trucks for this purpose about a year ago, and this experiment has been watched with considerable interest.

The experts agree that one of these motor trucks will do the work of six teams and that the saving in time thus accomplished will be over 65 per cent. As a result 35 machines are to be installed as soon as possible and it is estimated that 165 more will be required to take care of the city's needs. The first wagons are expected to meet the growing demand for better service in the outlying districts only.

The street commissioner has asked for an appropriation of $210,000 for garbage collection wagons and $200,000 for the purchase of motor street sweepers. The same plan has been followed with respect to the sweepers, and it would seem that the rented machines have demonstrated their value in this field as well.

This action on the part of the New York officials places that city in the lead among American municipalities along this line. It is understood that other communities are considering the purchase of similar vehicles and undoubtedly the experience here will have decided bearing upon the situation elsewhere.

DECIDED MAINTENANCE SAVING.

Experience in Victoria, B. C., Shows Splendid Economy Resulting from Motorized Fire Department.

June 2, 1911, two pieces of motor equipment were installed by the fire department of Victoria, B. C., and basing his estimates upon the experience gained with these Chief Thomas Davis believes that the department could be completely motorized at saving in annual expense of $5415. He finds that the cost of maintaining a single horse is $214.99 a year, as against $72 for one automobile hose wagon.

The two motor vehicles have cost absolutely nothing for repairs, and the chief estimates that this item would be no more for one class of equipment than for the other. He considers that the automobiles have an efficiency of at least 50 per cent. more than the horses, not to mention the fact that the former carries 1800 feet of hose as against 1100 feet for the latter. Granting that nine motor pieces would be required to replace the 18 horses now in service, the chief presents the following table of comparisons:



Adams 1.5-Ton Truck Chassis Fitted with Hose Wagon Body for Fire Department in Kittanning, Penn.

Annual Maintenance Cost for 18 Horses.

New horses (annual estimates)	$2000
Horse feed @ $13 a month each	2808
Repairing and renewing harnesses, brushes, brooms, soap, etc.	400
Stall planks	75
Veterinary fees @ $20 a month	240
Shoeing	540
Total for horses	$6063

Annual Maintenance Cost of Nine Automobiles.

Based on actual experience with present cars, showing monthly cost of $6 each	$648
Balance in favor of motor equipment	$5415

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BRIEF ITEMS FROM SEVERAL CITIES.

Truck for Road Construction—In order to complete the equipment which the board of public works in Louisville, Ky., needs to do the street work that has been planned, a five-ton motor truck will be bought in the near future. This vehicle is required for hauling broken rock and bricks to be used in construction work. The board already has a crusher and a mixer and with a motor truck to haul material the city expects to save the exorbitant prices charged by contractors.

Middleboro's New Fire Apparatus—A new combination fire truck, made by the Knox Automobile Company, Springfield, Mass., has been delivered and accepted by the officials of Middleboro, Mass. The apparatus weighs 7700 pounds and has carrying capacity of 4000 pounds. The equipment includes one 27-foot extension ladder, one 18-foot extension ladder with folding hooks and one 10-foot pole ladder for inside work. A 40-gallon chemical tank is located under the driver's seat. There are 200 feet of .75-inch chemical hose and in addition two receptacles and two soda containers, one Detroit door opener, two axes, two play pipe-holders, tool box at the rear and other spaces for storing necessary utensils and clothing. The truck is 48 horsepower and capable of 40 miles an hour and carries from 1000 to 1500 feet of regulation fire hose. It is equipped with Swinehart tires, made by the Swinehart Tire & Rubber Company, Akron, O.

Savannah Shows Decided Economy—Chief Ballyntyne of the fire department in Savannah, Ga., has prepared figures showing that the installation of motor fire equipment in that city has saved the city $4064.60 during the first nine months of 1912. The maintenance cost for the department during the corresponding period of 1911, when horses only were employed, was $8317.45, this item being exclusive of salaries, as against $4252.95 for the present year. This economy has resulted in the complete motorization of the department.

Washington Has Electric Ambulance—A Detroit electric ambulance, made by the Anderson Electric Car Company, Detroit, has been installed by the Central Dispensary & Emergency Hospital at Washington, D. C. The cost of operation and maintenance has averaged $15 a month for electric current, while as yet there has been no expense for repairs. The vehicle has answered about 250 calls a month and there has been a decided saving over the old method. The smooth running of the machine has proved its worth to many patients.

Brockton Wants Apparatus—At a recent meeting of the board of aldermen in Brockton, Mass., an order calling for $20,000 loan for additional motor fire apparatus was referred to the fire department committee. Brockton already has two motor driven combination wagons in its fire service. The new order calls for two additional motor combination vehicles and a tractor for the hook and ladder truck at the central station.

Insurance Men Study Motors—George W. Booth, chief engineer of the committee on fire prevention of the National Board of Fire Underwriters, has been appointed chairman of the commitee on automobile fire apparatus of the National Fire Protection Association. This committee is composed of Chief A. V. Bennett, Birmingham, Ala.; Fire Marshal H. W. Bringhurst, Seattle, Wash.; Chief John Kenlon, New York City; Chief W. H. Loller, Youngstown, O.; Vice President George M. Robertson, National Fire Protection Association, and G. W. Woodward, Factory Insurance Association. An interesting report is anticipated at the association's annual meeting in New York in May, 1913.

Fitchburg Wants Garbage Wagon—Dr. F. H. Thompson, chairman of the board of health in Fitchburg, Mass., has recommended the purchase of a motor vehicle as the only proper solution to the garbage collection problem. Frequent complaints have made it necessary to consider whether or not some means cannot be devised whereby it will be possible to make the rounds of the city in less time. At present it often takes from two to three weeks to make the necessary collections, whereas Dr. Thompson is of the opinion the work could be done by a motor truck in one or two days.

Motor Oil Sprinkler—The Knox Automobile Company, Springfield, Mass., maker of motor fire apparatus and all kinds of municipal service vehicles, is manufacturing a motor oil sprinkler for the street department of Springfield, Mass. The machine will cost between $4000 and $5000 and was ordered because of dissatisfaction with existing street sprinkling methods.

Seagrave Seeks Order—The terms asked by the city of Lowell, Mass., for a combination hose and chemical automobile fire wagon, have been accepted by the Seagrave Company, Columbus, O., maker of motor fire apparatus, which agrees to send a machine of the type specified to Lowell for tests. The car is to be delivered within 90 days.

In the Market—Following are cities and towns which are considering the purchase of motor fire apparatus: Lockport, N. Y.; Butte, Mont.; Portsmouth, Va.; Fort Wayne, Ind.; Ashland, Ore.; Washington, D. C.; Keene, N. H.; Albany, Ore.; Augusta, Me.; Douglas, Ariz.; San Luis Obispo, Cal.; Youngstown, O.; Huntington, N. Y.

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New Commercial Car Accessories

Newtone Superior Horn.

To meet the demand for a popular priced electric signalling horn the Automobile Supply Manufacturing Company, 220 Taaffe Place, Brooklyn, N. Y., has brought out the Newtone Superior horn. In it are incorporated the same high grade material and workmanship noticeable of the other horns made by this company and the new design is attractive and well finished. It is economical of current, requiring about 2.5 amperes, and the maker states that a battery will supply current for five months without recharging. All working parts are fully enclosed.

Turner Motor Washer.

A device operating on the compressed air principle is the Turner Motor Washer, manufactured by the Turner Brass Works, Sycamore, Ill. It is very compact, resembling in shape and construction the gas torch, and instead of a burner a nozzle member is fitted, having a fine opening through which the gasoline or other cleansing fluid is forced. The handle contains the pump mechanism and a few strokes develops a high pressure. By it dirt or grease may be quickly removed from the motor or chassis components and places not easily accessible by hand.

Crary Gasoline Lock.

The Crary gasoline lock, manufactured by the Crary Gasoline Lock Company, Detroit, is a device by means of which the supply of fuel from the tank to the carburetor may be shut off by the simple movement of the key, thereby preventing the use of the machine by others than those authorized. The lock is mounted upon the dash or other convenient place, actuates a flexible steel cable enclosed in a tube, and the cable operates a valve member. The lock is a Yale and the key is removable.

Electric Star Headlights.

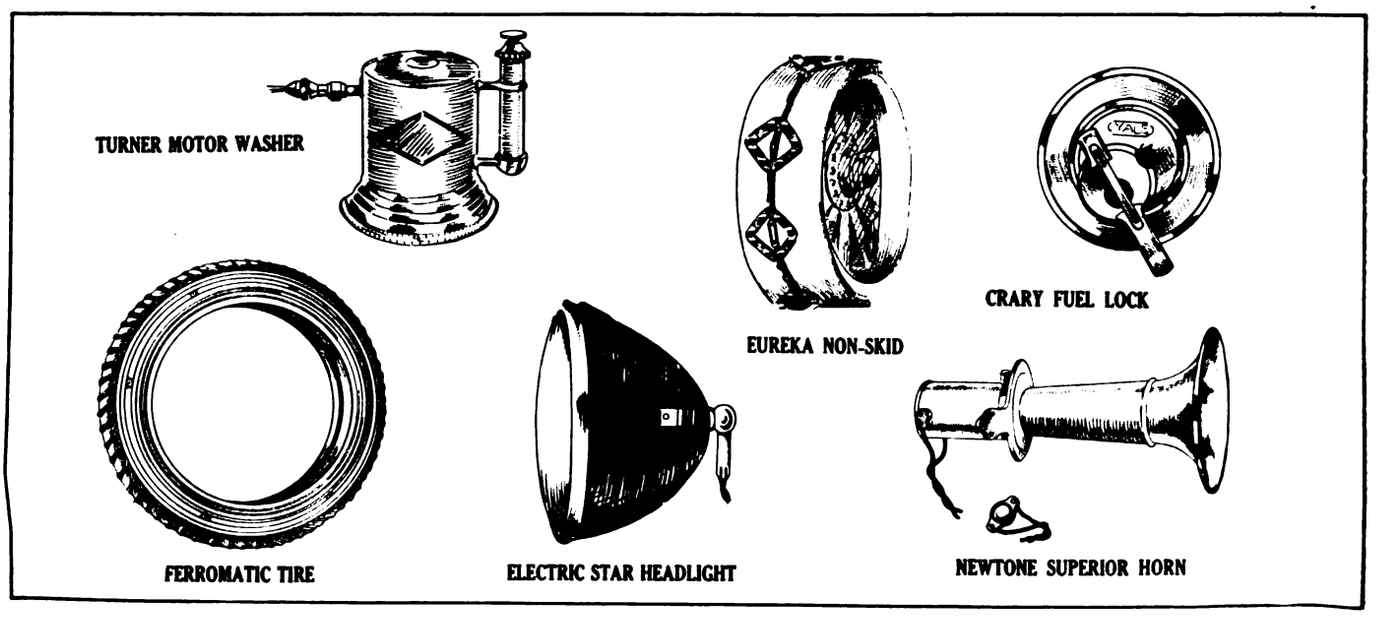
The Milwaukee Bronze Casting Company, Milwaukee, Wis., is manufacturing the Electric Star headlight, a special lamp designed expressly for commercial vehicles. One of the qualities of the design is that the light is constructed without rivets or solder and but one screw is utilized. It is cast of silvered aluminum, about .1875 inch thick and the interior is brought to a high polish, which does not tarnish. All lenses are convex and laid in rubber, making them water proof and dust tight. A feature of the lamp is the adjustable device whereby the light may be focussed easily. All connections are Ediswan and with either black enamel, brass or nickel trimmings.

Eureka Non-Skid Device.

The Eureka Non-Skid Manufacturing Company, Brooklyn, N. Y., is marketing a non-skid device for dual tires and a quality of it is that there are no side or cross chains, the retaining member being located between the two shoes. Suitable traction members are secured to the chain, which is drop forged, as are the plates.

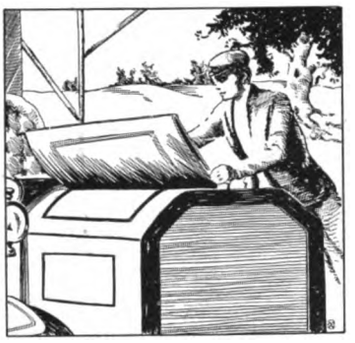
Ferromatic Tire.

The Ferromatic Tire & Manufacturing Company is producing the Ferromatic tire, which is designed to fit any quick detachable or clincher rim and to replace pneumatic shoes. It consists of a shell in two parts. One is a channel, which fits and is secured to the felloe of the wheel. The other, in two pieces, is connected with the channel members by means of springs. A solid rubber tread is utilized for traction member.



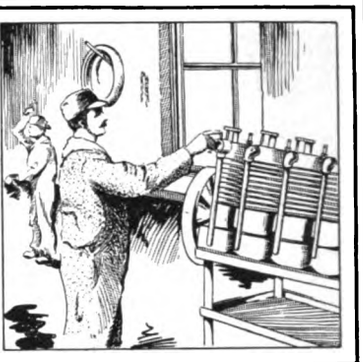
Illustrating New Accessories Applicable to the Commercial Vehicle, Repair Shop, Etc.

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AINTS·FOR·PROPER MAINTENANCE

A Department for the Owner, Driver and Repairman.



REMOVING BROKEN STUDS.

Removing broken studs is sometimes a difficult task and often the threads into which they fit are injured in the work. At Fig. 2 is illustrated a useful tool, the designer of which was awarded a prize in a competition among mechanics by a foreign publication. The drawing shows the device of .75-inch size, although it may be constructed to any desired proportion. It should save considerable labor in the shop.

The tool is made as follows: Take a piece of .25-inch round steel about five inches long and turn it down on the outside to the shape shown in the sketch. A 1.25-inch hole is drilled at the tapered end and tapped out to the bottom, taking care to make a clean thread. The tapered end is then screwed onto the outside and the stock end squared to take a tap wrench. A one-inch nut is then chased out and slightly tapered to suit the tapered end of the tool. Two saw cuts are then made across the screwed end, and these should go down to the bottom of the tapped hole. The tapered end should be hardened, but care should be taken that it is not made too hard or the jaws will break off in service.

In drawing studs the box should be screwed down onto the stud and the nut on the outside tightened with a wrench. The operation enables the tool to obtain a secure grip upon the stud, which can be removed with the aid of a tap wrench. When used as a stud box the nut should be slackened back until the box is down hard on the stud, and then the nut should be tightened and the tool employed as an ordinary stud box. The tool could be used as a die nut if required. When employing it with damaged threads, it should be handled carefully and plenty of lubricant used.

ADJUST SHOCK ABSORBERS.

Many cars of the light delivery type are fitted with shock absorbers and while these devices rarely require attention if properly installed it may be that a readjustment will become necessary. In order to accomplish the work successfully knowledge of the construction of the absorbers is essential.

At Fig. 1 is presented the well known Truffault-Hartford shock absorber and by referring to the drawing at C it will be noted that the device comprises a single arm a and a double member b, frictionally joined by an adjusting nut h. The arm a operates between the two sections of the arm b, providing an up-and-down movement, corresponding to that of the frame. The lower arm carries a flanged cover d, forming a cup like space on either side. Within these spaces are located friction discs. These are adjusted by the nut at h. The work of obtaining the desired tension is facilitated by the adjustment dial f having an indicator g. A compensating spring e is provided for automatically taking up the wear and maintaining a uniform friction after the adjustment has been made. The arms a and b are secured to the frame and axle by two frictional adjustable joints, the function of

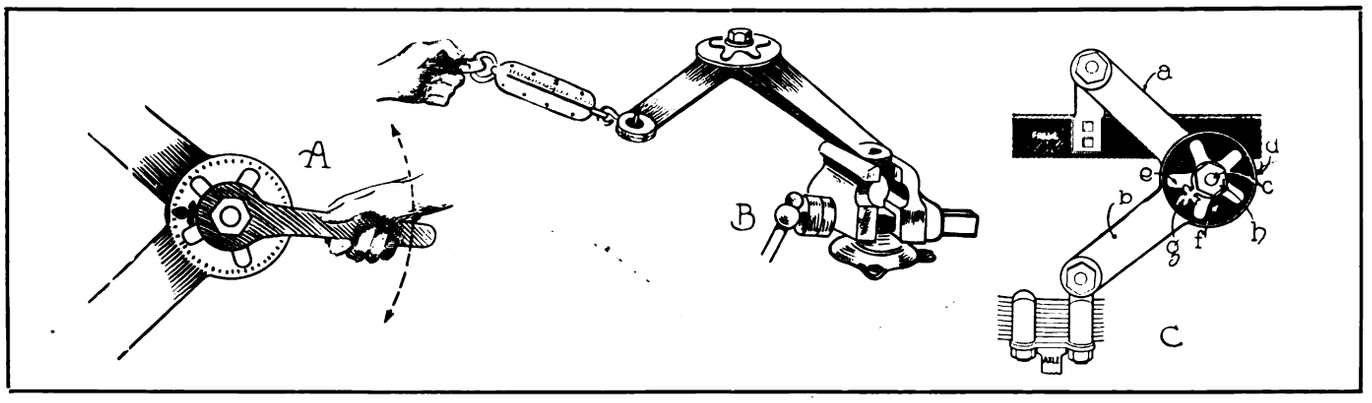


Fig. 1—Illustrating Adjustment of Truffault-Hartford Shock Absorbers: A, Showing How to Use Wrench and Direction of Rotation to Obtain Desired Tension; B, Method of Testing or Resetting with Spring Balance; C, Depicting Components of Absorber.

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which is to offer constant resistance to the vibration of the spring in either direction.

Each absorber has three frictional points: One

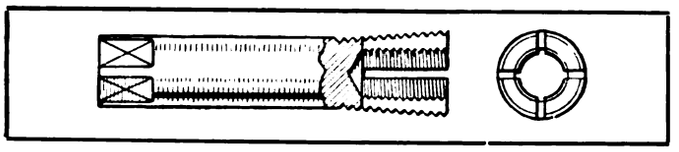


Fig. 2—A Useful Tool for Removing Broken Studs Which May Be Employed as a Die Nut.

each at the ends of the two arms and the third where these two members join. The tension is made at this point and a dial and indicator are employed to denote the amount of the tension. When the absorbers are new, the pointer is set at zero and to move it requires a 25-pound pull on a spring balance or ice scale for the standard size. The factory adjustment on the intermediate model is 23 pounds, that of the junior 19, and that on the juniorette 16.

To increase the tension the nut above the pointer should be turned to the right or clockwise with a wrench, and in an opposite direction to decrease the tension. As the pointer moves with the nut, the increase or decrease is denoted on the dial. The method of operation is outlined at A, the drawing showing plainly the proper movements. The maker points out that it is desirable to have a greater tension on the rear absorbers than on the front and that each pair should be adjusted alike.

The absorbers may be tested and adjusted by the method outlined at B. Secure the double arm in a vise as indicated in the drawing and turn the tension nut toward the right until it requires the desired pound pull on a spring balance to move the single or free arm. The brass cover or rim is then marked with a file to denote the position of the pointer.

Next loosen the nut with a wrench, taking care to count carefully the number of revolutions of the tool. Then turn the dial until the zero mark is in alignment with that made by the file. The nut is now turned back the same number of revolutions as was necessary to loosen it. This will give the proper tension with the indicator at zero. The absorbers are then adjusted as previously outlined. If the machine has a tendency to move up and down too freely, the tension should be increased, and diminished if the movement is restricted. Lubricant should not be employed as the friction discs, etc., are self-lubricating.

ANTI-FREEZING SOLUTIONS.

With the approach of freezing temperatures it is advisable to prepare an anti-freezing solution for the circulation system of the water-cooled car if the machine is to be exposed for any length of time or stored in an unheated building. For the benefit of those not familiar with the proper proportions of alcohol, calcium chloride, glycerine and combinations of these, the accompanying tables will be of value. In preparing the car for these solutions it is imperative that the

SOLUTIONS AND FREEZING POINTS.

Calcium Chloride.

		Degrees F.
1 pound salt—1 gallon water	Freezing point	27
2 pounds salt—1 gallon water	Freezing point	18
3 pounds salt—1 gallon water	Freezing point	1.5
4 pounds salt—1 gallon water	Freezing point	—17
5 pounds salt—1 gallon water	Freezing point	—39

Alcohol and Water.

		Degrees F.
Water 95%, Alcohol 5%	Freezing point	25
Water 90 Alcohol 10	Freezing point	18
Water 85 Alcohol 15	Freezing point	11
Water 80 Alcohol 20	Freezing point	5
Water 75 Alcohol 25	Freezing point	— 2
Water 70 Alcohol 30	Freezing point	— 9
Water 65 Alcohol 35	Freezing point	—15
Water 60 Alcohol 40	Freezing point	—23

Water, Alcohol and Glycerine.

		Degrees F.
Water 95%, Alcohol-Glycerine 5%	Freezing point	28
Water 90 Alcohol-Glycerine 10	Freezing point	25
Water 85 Alcohol-Glycerine 15	Freezing point	20
Water 80 Alcohol-Glycerine 20	Freezing point	15
Water 75 Alcohol-Glycerine 25	Freezing point	8
Water 70 Alcohol-Glycerine 30	Freezing point	— 5
Water 67 Alcohol-Glycerine 33	Freezing point	—15
Water 60 Alcohol-Glycerine 40	Freezing point	—23

Glycerine.

		Degrees F.
Water 95%, Glycerine 5%	Freezing point	30
Water 90 Glycerine 10	Freezing point	28
Water 85 Glycerine 15	Freezing point	25
Water 80 Glycerine 20	Freezing point	23
Water 75 Glycerine 25	Freezing point	19
Water 70 Glycerine 30	Freezing point	15
Water 65 Glycerine 35	Freezing point	12
Water 60 Glycerine 40	Freezing point	5
Water 50 Glycerine 50	Freezing point	— 2
Water 45 Glycerine 55	Freezing point	—10

radiator, pipes, pump, etc., be flushed out with water to remove any deposits that may have accumulated. In the maintenance of anti-freezing solutions it is essential that the mixture be tested from time to time to note if the freezing point has not been lowered by evaporation of the solution.

SPRING WINDING TOOL.

In the overhaul of the chassis the replacing of a broken spring may be necessary and when a special size is employed it is difficult to obtain the springs at

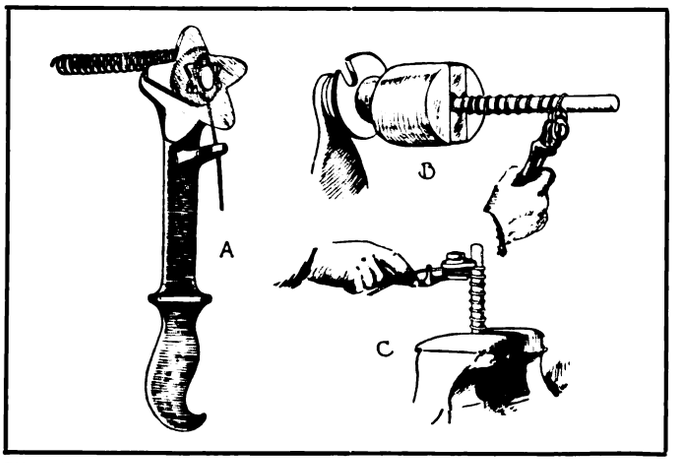


Fig. 3—A Handy Tool for the Repair Shop: A, the Perfection Spring Winder; B, Depicting Its Use in the Lathe; C, How Operated in the Vise.

the supply house. It may also be necessary to utilize one of greater tension, but not of larger diameter. The Remington Tool & Machine Company, Boston,

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is marketing a simple and inexpensive device known as the Perfection spring winder which is so constructed that it will wind accurately taper, double taper and right or left hand springs of any length, diameter or

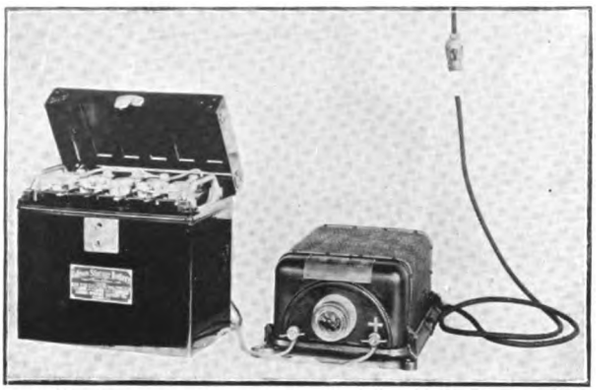


Fig. 4—The Edison Alternating Current Rectifier for Charging Storage Bateries.

pitch from any gauge wire. It is constructed in three sizes having capacities ranging from the smallest to .3125 inches.

The tool is illustrated at Fig. 3, the drawing at A showing how the wire is fed when the device is operated by hand, and that at C when in the vise with a mandrel. When utilized in the lathe or drill, an adjustable rotating disc provides for varying pitches as desired. The tool supports the arbor, making possible the winding of the very finest as well as largest springs without kinking, as shown at B.

THE EDISON A. C. RECTIFIER.

A simple and compact device for charging storage batteries where an alternating current is employed, is the Edison alternating current rectifier, produced by Thomas A. Edison, Inc., Orange, N. J., and shown at Figs. 4 and 5. The apparatus is stated by the maker to provide reliable and efficient means of charging batteries with alternating current and does not require the services of an expert, it being operated easily by anyone familiar with the ordinary snap button type of switch.

The rectifier is practically a simple electro-mechanical valve in that it allows current waves of only one polarity to pass through it to the cells. The simplicity of operation is depicted at Fig. 4 which shows the size B-2, eight amperes capacity, charging an Edison five-cell battery. The rectifier is provided with two wing nut terminals, the positive being indicated by a white +. This lead is connected to the positive of the cells and the other wire to the negative terminal. A connecting rod and plug provide means for supplying the current from the main line.

The apparatus is equipped with a snap type of switch having "on" and "off" positions and by turning the lever to the former the proper charging current flows to the battery. It is pointed out by the maker that a battery may be charged in the same time with an Edison rectifier as with a direct current.

At Fig. 5 is shown the rectifier, size B-4, 10 amperes capacity, charging two sets of batteries. In order to insure correct adjustment of the charging current, a regulating rheostat and ammeter are employed as a unit. This equipment in conjunction with a cut-out switch and a fuse, inexpensive and easily installed, is recommended by the company when lead batteries are to be charged and different rates of current flow are required.

All rectifiers are provided with terminals for connecting rheostats in the charging circuit and are constructed for 110 or 220-volt circuits in various sizes to meet individual requirements.

REMOVING RUST FROM NICKEL.

Rust spots may be removed from nickel by covering the affected part with vaseline or some similar substance and allowing it to stand for a number of hours, when it should be rubbed with a cloth dipped with ammonia. This treatment will remove ordinary rust spots, but if any difficulty develops, they should be carefully dampened with a little diluted hydrochloric acid and quickly wiped dry. The surfaces so treated should be washed with clean water, and when dry, rubbed with polishing powder.

TOOL AND MILD STEEL.

In a great many shops little if any attention is paid to the steel corner, rack or box. In some the most popular place is the floor. Very often machinery and tool steels are piled together in one heap, and when the workman goes to secure a piece he has to guess which is which. There are any number of means of finding this out, but a quick way to test the metal is to touch the end lightly against a dry emery wheel and watch the sparks as they strike. A tool steel gives forth a spark which seems to burst into a bright point of light

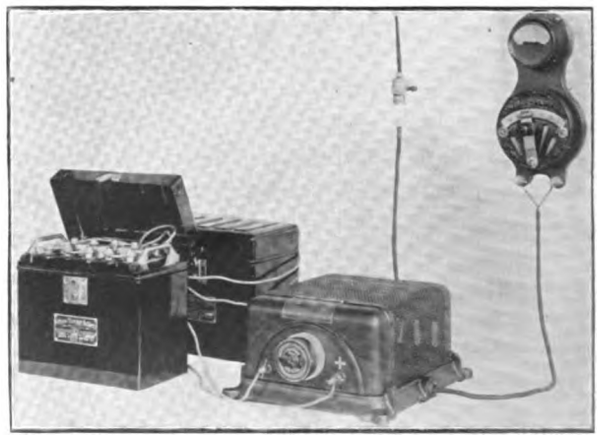


Fig. 5—The Edison Apparatus with Rheostat and Ammeter for Service Where Different Charging Rates Are Required.

as it strikes against the frame of the grinder, while that from machinery steel is merely a dull red incandescent particle. All air hardened steels give forth bright red sparks.

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CORRESPONDENCE.

Bending Copper Tubing.

(18)—In attempting to fit copper tubing to the headlights, that is, to connect the tank with the lights, I experienced trouble in bending the piping to conform to the bends needed and spoiled several pieces of tubing. What is the best way to handle the material? READER.
Malden, Mass., Nov. 17.

The trouble was doubtless due to the fact that the tubing was not annealed. Annealed tubing should be used and piping may be annealed easily by heating to a dull red and plunging it into water. Brass is superior for conducting acetylene as the chemical action set up on copper results in clogging the tubing.

Troublesome Vibrating Coil.

(19)—We have a small runabout, four-cylinder, which is fitted with a four-unit coil and storage battery, which we employ for errand work. The coil has been giving considerable trouble as two of the vibrators do not work properly. At low speeds the motor will miss, but runs fairly well on high. Had an expert repairman look it over and he states that the coils have broken down. Tried another coil and the engine ran perfectly. As I do not care to expend money for a new coil, which will cost $40, would like to know how the trouble may be overcome? INFORMATION.
Hartford, Conn., Nov. 20.

The best method would be to fit a new coil. This should not be done, however, until the old member has been thoroughly examined by an expert. The writer suggests that the coil be sent to the maker, stating the trouble experienced, and the manufacturer will advise as to the cause and cost of repair. The make was not stated, but the address will usually be found upon the coil.

Adjustments of Remy Magneto.

(20)—What attention, if any, is necessary for the proper operation of the Remy magneto? There is one fitted to the truck I drive and care for and I should like to have information as to oiling and possible adjustment. The magneto is working fine, but I want to be prepared if anything does go wrong. I. W. BENNETT.
Oneida, N. Y., Nov. 8.

The Remy magneto requires no attention other than oiling and the places are plainly marked upon the instrument. A few drops of lubricant about every 1000 miles is recommended by the maker. Too copious oiling will not injure the magneto, but should be avoided. The cam oiler wick, shown at Fig. 6, which bears upon the cam at all times, providing a thin film of oil, should be examined from time to time to see that the wick does not become dry. This wick is lubricated through an oil aperture as will be noted.

Be careful not to flood the circuit breaker housing with lubricant as the use of too much oil will tend to throw it upon the platinum points. Oil or grease upon these members tends to destroy the metal as the lubricant furnishes a volatile material which will cause arcing and rapid depreciation of the platinum. The efficiency of the magneto will also be impaired.

The platinum contact points will not require attention unless the surfaces become uneven through the application of oil, etc. They should always have a good, square, flat contact at the time of breaking, which operation is performed by the cam, a function similar to the contact roller of the conventional timer in the battery and coil systems of ignition. If the points become uneven they should be trued carefully with a small piece of fine emery cloth or a fine flat file.

Proper adjustment of the points is essential for successful operation of the magneto. The opening should be set primarily at about .025 inch. If the motor misses at slow speed with the spark retarded, the contact screw should be adjusted a notch at the time to the left, or "out," until the engine fires evenly. If the motor misses at high speed with the spark advanced, the contact screw should be screwed in, or to the right, until satisfactory operation is secured.

It is important that the wires be inspected to make sure that all connections are tight and free from contact with motor parts, as chafing is liable to ensue, causing short circuitng. Leads and cables should not be allowed to become saturated with oil or grease, or exposed to water. If in the overhaul the wires must be removed it will be advisable to mark these if the colors have become indiscernible.

There is no necessity of taking the magneto to

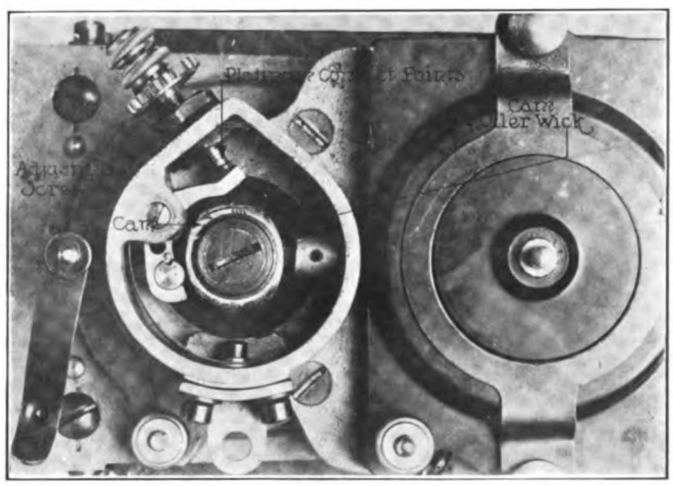


Fig. 6—Illustrating Components of Remy Magneto Breaker Box and Parts Requiring Attention.

pieces in the event of trouble as all that may be done by the novice is to clean the platinum points and adjust them as outlined, an operation that may be performed without tools. In the event of serious trouble such as damage through accident, the magneto should be shipped to the nearest service station, a number of which are maintained by the company.

Motor and Generator.

(21)—What is the difference between an electric motor and a generator and why are two separate machines employed for lighting and starting a car? INTERESTED.
Toledo, O., Nov. 21.

The difference between an electric motor and a dynamo or generator is that the former is energized by electricity and transmits power, while the dynamo generates or makes electricity. For car lighting a generator or dynamo is employed for generating current for the lamps and for charging a storage battery. The motor starter is supplied with current from the battery. In some systems, the Delco for instance, the motor and dynamo are combined and the desired results are obtained by the windings.

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LOAD CARRYING WEIGHTS FOR TIRES.

A TOPIC of natural interest to all owners and operators of motor driven commercial vehicles is the discussion of methods to prevent the wear and tear of solid rubber tires. C. W. Martin, sales manager of the Goodyear Tire & Rubber Company, Akron, O., admits that this part of the equipment is the most serious item in the cost of truck up-keep. He holds, however, that there are many apparently insignificant details in the operation and care of a power wagon which have an important bearing upon the life and service of its tires. The following observations are a result of his investigation of the subject:

Natural or ordinary wear under normal conditions, causing abrasion, is attributable principally to tractive effort, starting and stopping, or skidding. When these elements are not attended by others, which will be described later, a solid rubber tire can be expected to give the maximum service and to wear out legitimately.

Undue abrasion may be caused by wheels being out of alignment, resulting in a tire wearing down smoothly and prematurely, thus more than likely causing an impression with the truck owner that the tire is not all that it should be in the matter of quality and workmanship. Disalignment sufficient to produce this effect in at least some degree may be so slight as to be unnoticeable in the absence of special attention.

Wheels out of alignment are found very frequently, particularly front wheels. Usually these result from striking glancing blows against curbstones or any other obstruction, causing bent axles, wrenched steering knuckles, or dished wheels. The wear is the same as would be obtained by holding the tread of the tire on a swiftly moving grindstone and revolving it slowly. Turning the front wheels by means of the steering apparatus when the truck is not in motion also has its bad effect.

Disalignment may be detected by measuring the distance between rims of the two front or two rear wheels at the extreme fore and aft points, care being exercised to see that the front wheels, when measuring them, are pointing straight ahead or parallel with the body of the truck. The distance at fore and aft points will be found to be the same if the wheels are in perfect alignment.

Travelling over exceedingly rough pavements and sharp stones, such as are found on newly macadamized roads, produces cuts into which sand and grit work, slowly enlarging the gap and eventually causing the destruction of a solid rubber tire. Continual running in car tracks invariably results in a similar manner, as the edge of the tire, or the very small portion which runs on the rail is carrying the load intended for the whole tire. Also, a shearing effect is thus produced which is very injurious to the tire's fastening. Cutting also may be caused by careless driving on streets in normal condition or by careful driving combined with overloading, or because of bad streets.

Disintegration may be due to the tire being allowed to stand in oil in the garage. Oil has a chemical effect upon rubber which is extremely injurious.

In this day of increasing popularity of demountable tires and standard wheels as adopted by the Society of Automobile Engineers, it is important that wheels be of proper dimensions and that all bolts be thoroughly tightened so as to prevent circumferential movement of the tire on the wheel.

A tire will fail to stand up under overloading, which strains the fastening and crushes the tread, causing bruises and chafing. Speeding virtually has the same results as overloading, producing shocks when riding over obstacles of various kinds, which bruise and cut the rubber.

As a result of these investigations and after a thorough scientific analysis of all conditions and requirements in its experimental engineering department, the Goodyear company has adopted and recommends the graduated table of carrying weights presented herewith. It will be noted that tires are rated according to their diameters as well as their cross sectional size, and it is maintained that speed has been given proper consideration. Mr. Martin believes that a careful observation of this table will have its effect in reducing truck tire mileage cost.

Graduated Table and Tire Carrying Weights.

Cross section		Diameters 32″	34″	36″	38″	40″	42″	
		lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	mph.
2″	Singles	450	475	500	525	550	575	20
2.5″	"	670	710	750	790	830	870	20
3″	"	900	950	1000	1050	1100	1150	20
3.5″	"	1130	1190	1250	1310	1370	1430	18
4″	"	1350	1425	1500	1575	1650	1725	16
5″	"	1800	1900	2000	2100	2200	2300	14
6″	"	2250	2375	2500	2625	2750	2875	12
7″	"	2700	2850	3000	3150	3300	3450	10
2″	Dual	1125	1188	1250	1312	1375	1438	18
2.5″	"	1675	1775	1875	1975	2075	2175	18
3″	"	2250	2375	2500	2625	2750	2875	16
3.5″	"	2825	2975	3125	3275	3425	3575	14
4″	"	3375	3560	3750	3940	4125	4310	13
5″	"	4500	4750	5000	5250	5500	5750	12
6″	"	5625	5940	6250	6565	6875	7190	10
7″	"	6750	7125	7500	7875	8250	8625	10

New Advertising Firm—An evidence of the increasing attention being given to the most efficient methods of marketing engineering and technical products appears in the announcement of the formation of Wightman and Richards, technical department of Jos. A. Richards & Staff, Tribune building, New York City, representing the association of Joseph A. Richards, Lucius I. Wightman and Paul Morse Richards. Joseph A. Richards is the head of the agency having his name, an institution which was founded by Joseph H. Richards in 1872. Mr. Wightman is an engineer who has specialized in advertising and marketing machinery and engineering products for some years. Paul Morse Richards is a publisher, sales manager and advertising man of wide experience.

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FOREIGN TRUCK NOTES OF INTEREST

LACRE COLLIERY RESCUE CARS.

First Vehicles Produced to Comply with the Recent Act of the British Parliament.

In compliance with an act of the British Parliament, passed in 1910, which makes it compulsory upon all colliery operators to maintain a motor vehicle in constant readiness for the supply and maintenance of ambulances, at least two rescue stations have acquired machines made by the Lacre Motor Car Company, Ltd., London. One of these is shown in an accompanying illustration, this being installed at the Rhymney Valley station, while the other is at the Aberaman station.

These machines are fitted to the regulation 38 horsepower chassis produced by the Lacre company, and the most interest naturally attaches to the body equipment. As will be noted the general appearance is that of an ambulance, and it differs principally in the provision for carrying the necessary oxygen plant and other rescue appliances. These cars are the first to be placed in service in compliance with the law.

The interior is arranged to accommodate 11 men. Separate compartments are provided for 11 sets of draeger outfits, these being disposed along the sides in the spaces to which the covers have been opened in the photograph. Four oxygen cylinders are carried in the compartment directly underneath that for the draeger outfit back of the driver's seat. Four pulmotors are located immediately under these, and at the extreme rear. Tools are carried in another compartment directly over that occupied by the draeger outfit back of the driver. A well is accessible from the interior by lifting four hinged doors, and in this are carried potash cartridges and hand lamps. Provision also is made at the side of driver's seat for pump and extinguishers.



Lacre Vehicle of British Manufacture Fitted for Service With Colliery Rescue Station.

PRIZES FOR TRACTION PLOWS.

Splendid Opportunity Offered American Manufacturers in Connection with South African Show.

The Port Elizabeth Agricultural Society of Port Elizabeth, Cape Colony, South Africa, has decided to offer cash prizes in connection with tests for traction plows at its annual show in the spring of 1913. The prizes are to be three in number, the first, $500, for the best motor tractor; second, $125, for the best disc plow suitable for direct traction; third, $125, for the best mold board plow, all to be shown at work. The field tests are to be held under the direction of the Port Elizabeth Agricultural Society, but the Cape Field Trial Association will probably be requested to assume the active supervision and arrange details. All traction engines taking part in the contests will be required to be placed on exhibition at the show.

This display is one of the best in South Africa and is attended by thousands from all over Cape Colony, Orange River, Transvaal, Natal and even from Rhodesia. This test of traction plows, the first to be held in South Africa, is attracting much attention and will undoubtedly be the feature of the exhibition. The most successful machines will have a great opportunity in South African markets. Vast tracts of veldt hitherto unbroken will be cultivated during the next few years and in this development work the traction plow is destined to play an important part. United States Consul E. A. Wakefield of Port Elizabeth issues a word of advice and of warning as well to American producers. He says:

"American manufacturers should be alive to this opening with a determined effort to make a creditable and satisfactory exhibit. While the show takes place the first week in April, the tests will be held March 24-29. Thirty-five to 40 days should be allowed for transit from New York, with reasonable period for clearing, landing and preparation after arrival. A thoroughly efficient man should accompany the machine as

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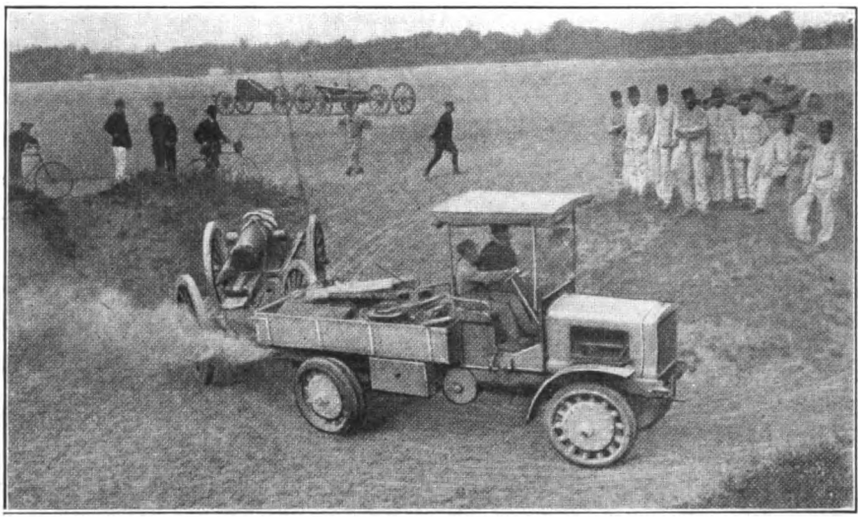
operator at the test and demonstrator at the exhibition. No details which might possibly interfere with the tests, such as spare parts, careful packing and early shipment by sure route, should be neglected."

BRITISH DAIRYMEN INTERESTED.

Motor Delivery Wagons Play an Important Part in Recent Exhibition at Islington, England.

The 37th annual dairy show, under the direction of the British Farmers' Association, was held recently at Agricultural Hall, Islington, England, and was attended by the usual large number of farmers and others who were more or less interested in the exhibition. The question of transport is one which closely concerns dairymen, and a number of motor manufacturers exhibited vehicles suited to the requirements of this particular industry.

Four vehicles were exhibited, among them being the Studebaker 1100-pound delivery van, marketed by the British Studebaker Corporation and made by the Studebaker Corporation, Detroit, Mich. This attracted particular attention and seemed to be the favorite inasmuch as many of them are in service in England and giving remarkably good results in the transportation of light loads. The three additional machines exhibited were of the three-wheel class, one being a 1500-pound gasoline machine, while the other two were 900-pound electric vehicles, made by the Torpedo Motor Company of Germany.



Type of Chassis Selected by French Army for Hauling Machine Guns.

HAULING GUNS BY MOTORS.

French Army Adopts Four-Wheel Driven Tractors as Result of Recent Military Manoeuvres.

As a result of the recent military manoeuvres in France the French minister of war has decided that in the future the gun carriages for the largest cannon shall be drawn by motor tractors of the four-wheel drive type. The troops in Morocco will be supplied with these vehicles immediately. An accompanying illustration shows one of the new tractors engaged in the recent manoeuvres.

These vehicles are made by Panhard et Levassor. The motor is a six-cylinder unit with bore of 3.9 inches and stroke of 5.5, rated at 35 horsepower at 1000 revolutions a minute and 45 at 1400. The cylinders are cast separately, but are coupled in such manner as to form a common water chamber, presenting the advantages of ease of operation, assembly and replacement of separate cylinders and the simplicity and compactness of the block casting, it is maintained. Ignition is by high-tension magneto.

The clutch is a multiple disc, and the transmission provides four forward speeds and reverse. It should be stated that the four-wheel drive is accomplished by means of a differential on each axle and a third between the two axles. The transmission is without joint of any kind, yet it permits free movement of the axles at their attachment to the chassis, and the steering arrangement is such that it assures equal and simultaneous adjustment at all four wheels.

Two sets of brakes are fitted, in addition to the braking effect possible with the motor. Each half of the differential shaft carries a drum, on the interior of which are friction shoes, actuated by pressure on the pedal. The hand operated members are on the wheels. These latter are of cast steel, with rubber tires, single in front and dual in the rear. The suspension is by means of four springs mounted in grooves on the chassis and joined onto axles.

Under the chassis in front is fixed a windlass, this being placed in a horizontal position with reference to the axle. This is operated by an endless screw, the shaft of which is carried by a set of gears in front of the transmission case. The drum of the windlass carries sufficient steel cable to permit of the tractor being extricated from any difficult situation. At the rear is a hook with an elastic spring yoke, and hooks also are fixed to each end of the frame.

MOTOR 'BUSES IN INDIA.

Vehicles of the Gasoline-Electric Type Meet with Decided Success Among the Natives.

An accompanying illustration presents two of the Tilling-Stevens gasoline-electric omnibuses produced by Tilling et Stevens in France and utilized with splendid success in British India. They are similar in most respects to those of the same make which have been

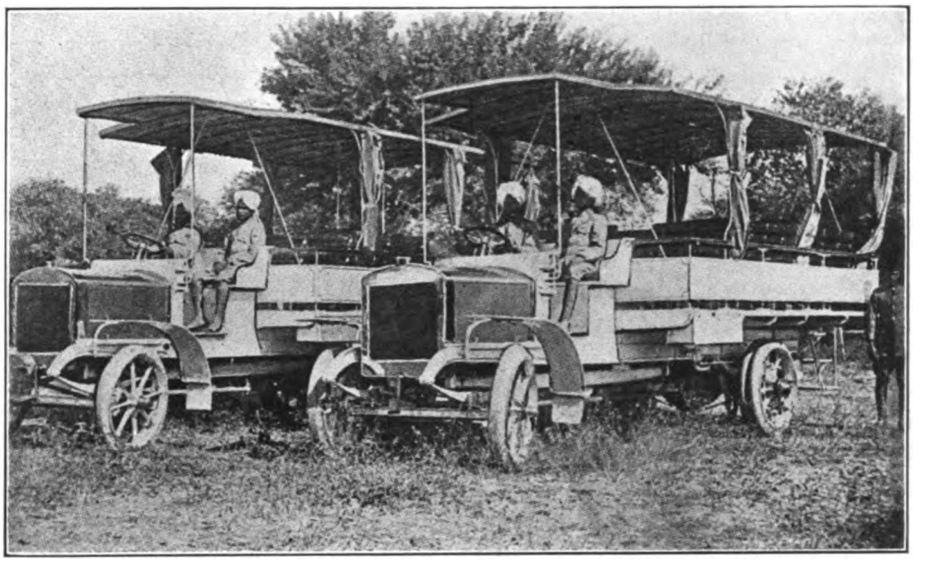
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used for some time in London, with the exception of the body equipment, which in this case is arranged to seat 34 persons, disposed in much the same manner as in the open street cars in this country. The London vehicles are of the enclosed type.

The gasoline motor is a four-cylinder unit, with bore of 4.13 inches and stroke of 4.92. Cooling is by water, circulation being by pump. Ignition is by true high-tension magneto. The electric motor is designed to deliver from one to 25 kilowatts at a speed varying from 350 to 1400 revolutions a minute, the control being by levers located within easy access of the driver.

GENERAL NEWS FROM ABROAD.

Motor Trucks in China—Several of the merchants in the Far East, according to an American consul, are contemplating the establishment of a forwarding company having for its main purpose the transportation of heavy cargo between various points in a local city. Application has been filed with the government for the formation of a joint stock company and if a successful issue results it is likely that 10 trucks will be needed for the work. It is thought that motor vehicles having capacity of seven tons will be needed. It is advisable that American manufacturers send catalogues, price lists, etc., to a person named in the report. Full information can be obtained of the bureau of foreign and domestic commerce, Washington, D. C., by reference to file number 9849. Duplicate catalogues should also be sent to the consul submitting the inquiry.



Two Tilling-Stevens Gasoline-Electric Omnibuses in Service in British India.

Electric Machines in Berlin—The Berlin, Germany, street cleaning department is planning to introduce electrically propelled street sweepers and to supplant the horse drawn equipment by degrees. The department has for some time had a number of storage battery driven street washers at work and has been so pleased with them that it is decided to strengthen the fleet. The budget of Berlin for 1913 will include estimates for two self-propelled road sweepers.

Gramm Truck in Cuba—The Gramm Motor Truck Company, Lima, O., maker of Gramm trucks, has found a profitable field of endeavor in Cuba and contracts were recently signed for the delivery of six trucks at Havana. The vehicles will be of the standard Gramm five-ton model, with electrically operated dump bodies for use by a contractor who does a large amount of excavating in the Cuban capital. It is said there is also a field in Cuba for passenger carrying vehicles owing to the constant increase of traffic. A suggestion has been made that the railway authorities should purchase motor trucks and run them in the interests of the commercial community.

Wants Traction Plows—A report from an American consular officer states that since the announcement of the prize competition for traction plows to be held in South Africa, there have been many requests at his office for catalogues and information. Two firms are desirous of getting in touch with a reliable company producing efficient motor tractors capable of being operated without requiring too much water for cooling purposes, as in many sections water is a scarce commodity. The tractor and plow must be separable and the tractor available for other purposes. Full information may be obtained by addressing the bureau of domestic and foreign commerce, Washington, D. C.

Favors American Machines—Supplementing a previous report regarding the establishment of a motor passenger service between two points in his district, an American consul reports that the firm which is interested in this proposition has written of the indisposition of American manufacturers to demonstrate their cars or to guarantee them. The firm desires proposals and prices should include cost of demonstration. The firm is in the market for two motor trucks of 16 to 18 passenger capacity. Four more are to be ordered as soon as the successful car has been found. Information can be secured by referring to file number 9827 of the bureau of foreign and domestic commerce, Washington, D. C.

International Motor Exhibit—An international exhibition of industrial motors will be held at Parma, Italian Department of Emilia, from June to October, 1913. The competitive exhibition will be divided into three parts as follows: An international competition of motors for deep plowing; competition of internal combustion motors burning heavy oils; national

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competition of internal combustion motors using oil, petroleum and gasoline as fuel and adapted to agricultural use. In the first competition there will be three contests, according to the depth plowed—eight to 10 inches, 12 to 14 inches and 16 inches or over. In the other two contests the trials will cover six hours at full force and heavily loaded under working conditions, six hours half-loaded, and three hours unloaded. Applications for entry in the tests should be received before March 31, 1913, by the Italian Touring Club, via Monte Napoleone 14, Milan, Italy.

Fiat Machines in Australia—Tooth & Co., Ltd., of Sydney, Australia, largest brewery house in the commonwealth, employs during the busy season about 350 horse drawn vehicles in its delivery work. It recently purchased through Garratts, Ltd., sole agents in New South Wales for Fiat cars, a 30 horsepower four-cylinder three-ton Fiat motor truck and as a result of the reliability and economy of the machine it has placed an order for 10 more similar vehicles. The company intends, it is said, to increase its motor fleet to 30 machines during the next year.

English Police Prison Van—The Huddersfield police officials of Huddersfield, England, have just purchased of Clayton & Co., Ltd., a motor van for the conveyance of prisoners from that city to Wakefield. The body of the machine is built to accommodate eight prisoners, four on each side of a central division, while extra seats are provided at the front and rear. There are two windows on each side near the top of the vehicle and one in the upper panel of the door at the rear, all of them being heavily barred to prevent any possible escape of convicts.

Noteworthy Deep Plowing in England—A Marshall oil tractor which has been engaged in deep plowing and sub-soiling operations at Gainsborough, England, has attracted exceptional interest, in view of the fact that the tractor, which was designed especially for preparing waste land for the cultivation of sugar beets, plowed two furrows, 22 inches wide, to a depth of 19 inches, while the plow was fitted with two subsoil tines which penetrated to a depth of six inches below the bottom of the furrows. This remarkable exhibition in deep plowing is particularly noteworthy, as it is the first attempt that has been made in England to plow so deep as 19 inches, while in all probability it is the first machine made in that country for working at that depth.

New Motor Trucks for German Army—The Bussing Works of Brunswick, Germany, has supplied two motor wagons to the automobile battalion of the German army, designed in accordance with the latest military regulations and propelled by 35 horsepower motors. The main difference between the 1913 army type of vehicle and that previously employed is in the overall width, which has been reduced. This reduction was rendered necessary on account of the narrowness of some mountain roads, especially in the Ardennes and Vosges. The machines have been designed to carry a load of four tons and to haul a trailer carrying two tons. The arrangement of the hand brake and change speed levers is placed more conveniently for the driver than was formerly the case and the hood affords fine protection even in the most inclement weather. The machines are equipped with the Bussing patent double coil suspension of the front axle and with spring drawbars. Chain drive is employed, being considered the most suitable for heavy vehicle work.

Glasgow's Sweeping Machine—A motor sweeping machine, built by Thomas Green & Sons, Ltd., Leeds, is in service with the city of Glasgow, Scotland, having been secured a short time ago and is reported to be doing good work. That the officials of the city appreciate the advantages of motor vehicles is shown by the number that have been installed in the various branches of the service. A watering machine has been added to the equipment and bids are being asked for a three-ton gasoline wagon to be used for collecting refuse from the extended areas of the city. Experiments have been carried on with motor mowers for the parks department; the sanitary department is acquiring several light vans and the salvage corps, which has been wholly dependent upon horses, has two 50 horsepower vehicles ordered for delivery soon.

Paris Company Installs Electrics—The General Omnibus Company of Paris, France, is to make extended trials with electric omnibuses. The first machine will be of French make, but fitted with the Edison storage battery. The Paris company operates about 800 motor cabs and some horse drawn carriages, but by the terms of its recently renewed contract the latter are to be superseded at the end of the current year by mechanically propelled vehicles. That the French constructors should feel compelled to utilize an American storage battery is of particular interest in this connection.

Large Hungarian Mail Fleet—The Hungarian postoffice department will, within the next six years, have acquired 500 automobiles of various types, for the government mail service. Among those to be secured will be 250 letter collecting voiturettes of eight horsepower; 100 parcel vans of 16 horsepower; 75 parcel and passenger vehicles of 30 horsepower, and 75 parcel vans of 30 horsepower. The government, through the minister of commerce, announced, however, that it will only accept bids from home makers. If American producers should have a producing branch in that country there is no doubt that they could secure the business, inasmuch as the Hungarian manufacturers can make no headway against foreign machines without government assistance. The voiturettes, it is stated, will supplant motorcycles with sidecars.

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"WE'LL DELIVER IT TODAY."

KisselKar Enables Merchant to Make and Keep This Promise to Afternoon Customers.

A western merchant who recently replaced his horses with KisselKar motor trucks has built up a systematic campaign of advertising around the new and quicker delivery service. The slogan he has adopted is, "We'll deliver it today," and this has been featured on his wagons, in his show windows and in the newspapers of his city. The results, the merchant states, have proved immensely profitable. His enterprise has solved one of the weakest points in his business—the inability to promise delivery on the day of purchase.

"Formerly we were obliged to make a rule that no promise of delivery the same day should be made to customers making purchases in the afternoon," he says. "Many sales were lost because of this necessity. Now we can positively insure delivery before night of articles bought up to 4 in the afternoon and in some cases later."

TRUCKS PROVE WORTH.

Now Used to Haul 90 Per Cent. of All Pianos Moved in Chicago.

When motor trucks were first introduced in the business world, doubt was expressed by piano dealers regarding its practicability for moving pianos, for which exceptional care must be exercised in handling to deliver in perfect condition. It was claimed that motor trucks did not possess the easy riding qualities of horse drawn vehicles. In spite of all these claims, which later experience has shown were without foundation, some of the earlier Gramm trucks, made by the Gramm Motor Truck Company, Lima, O., were sold to piano dealers. Practically all of them are still in service and others have been ordered by the owners.

C. E. B. Adams of Adams & Engs, Chicago, says that 90 per cent. of the pianos now delivered in Chicago are being hauled on trucks. This shows how largely the mechanical transport has replaced the horse and wagon for piano delivery in that city and these conditions may be said to be approximately true of all the larger centres of the country.

NEW CANADIAN COMPANY.

Secures Assets of Clinton Motor Car Company and Will Make Trucks and Pleasure Cars.

The Saskatoon Clinton Motor Car Company, Saskatoon, Can., has been formed with a capital of $500,000 to purchase designs, etc., and complete assets of the Clinton Motor Car Company, Ltd., Clinton, Ont., and will manufacture pleasure cars, trucks and light delivery wagons which have been developed by the Clinton company and which have proved so very successful in western Canada. The company has erected buildings having an aggregate floor space of 80,000 square feet and it is planning to be in the market with a full line of cars and trucks for the winter shows.

E. D. Cleghorn will be general manager and C. W. Whitmore, late vice president of the Toronto Auto Top & Body Company, general superintendent. The provisional directors are: William Jackson, president; Christopher Keane, vice president; Ernest Holmes, secretary-treasurer; Joseph H. Holmes and E. D. Cleghorn.

COLLEGE AUTOMOBILE COURSE.

University of Missouri Would Prepare Men for Engineering Department of Industry.

The University of Missouri will establish a department of instruction in automobile engineering if a sufficiently large appropriation can be obtained from the state legislature. So far as known this will be the first school of its kind. Stewart McDonald, vice president of the Moon Motor Car Company, St. Louis, Mo., maker of Moon pleasure and commercial vehicles, will be the professor in charge of the department.

Mr. McDonald is a graduate of the engineering department of Cornell University and is considered one of the best automobile engineers in the country. The proposal to establish a college course of the kind suggested is regarded as a testimonial to the growing importance of the automobile industry in the United States and especially in the West.

Federals in Automobile Industry—Members of the allied automobile trades who feel called upon to use the service of motor trucks have in many instances purchased the Federal one-ton delivery machines, made by the Federal Motor Truck Company, Detroit. Among those who have purchased Federals are: Hupp Motor Car Company, Abbott Motor Company, K-R-I-T Motor Car Company, Briggs-Detroiter Company, automobile manufacturers; Gemmer Manufacturing Company, Kelsey Wheel Company, Firestone Tire and Rubber Company, Goodyear Tire & Rubber Company, Herbert Manufacturing Company, Russell Wheel & Foundry Company, Russell Motor Axle Company and McCord Manufacturing Company, makers of automobile parts and accessories, all of Detroit.

Perkins & Corliss, an automobile firm in Gloucester, Mass., recently inaugurated a 'bus line for the purpose of taking summer visitors at the quaint fishing town to the points of interest at Bass Rocks, Eastern Point and East Gloucester. It is almost needless to say that the success of the venture has assured its adoption as a regular summer institution. Packard machines, made by the Packard Motor Car Company, Detroit, are being used.

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THE A B C OF MOTOR TRUCK IGNITION.

Part IV--Outlining the Various Systems Utilized with the Commercial Gasoline Vehicle, Their Components and Application in Practise---Explaining the Construction and Operation of the Induction Coil and Function of the Timer.

By C. P. Shattuck.

IT HAS been explained that the high-tension current utilized with the jump spark coil system of ignition is secured from a low-tension current supplied by a group of dry cells, storage battery or mechanical generator registering approximately six volts, and that the voltage is greatly augmented by induction. This building up of the current or electrical pressure is essential to enable it to jump the spark across the space or gap existing between the electrode and shell of the spark plug.

Although there is little the novice may undertake in connection with the commercial type of induction coil, other than to clean the platinum contacts and adjust the vibrator, a knowledge of its components and operation will be of value in studying other high-tension systems, such as the magneto, etc.

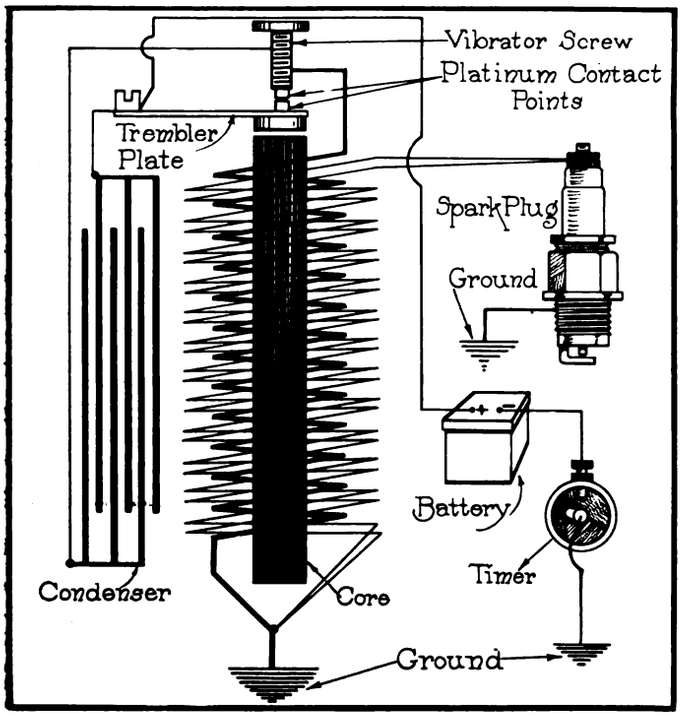


Fig. 14—Components of the Induction Coil, Showing Its Windings and Arrangement of Primary and Secondary Circuits.

Components of Induction Coil.

At Fig. 14 is presented a sketch of an induction coil, showing the different windings, also the primary and secondary circuits and other components necessary for the operation of the system. The primary winding or coil is indicated by the heavy wavy lines and it will be noted that there is a smaller number of turns than with the fine or secondary winding. The primary is of comparatively coarse copper wire and the coils are very well insulated from the secondary. The latter is a very fine, insulated wire, and the number of turns greatly exceeds that of the primary. Upon the length of the wire depends the electrical pressure; that is, any pressure of current may be generated in the secondary winding by varying the proportions of the two windings in the coil and the amount of current passing through the primary.

Primary Circuit.

The components of the primary circuit include a suitable switch for closing the circuit, a chemical battery or a mechanical generator, and a suitable make and break mechanism, usually operated by the magnetism of the core, termed the vibrator. This making and breaking of the primary circuit generates a very high electromotive force in the secondary winding, producing a spark at the gap of the plug as previously explained. Other components of the coil include the iron core, around which is wound the primary and secondary windings, the condenser, vibrator screw and trembler plate or blade.

Construction of Vibrator.

With the jump spark coil it is necessary to incorporate some means for interrupting or breaking the primary circuit in order to produce the desired spark, or in other words to build up the electrical pressure required to force the current to bridge the air space of the spark plug. The device is known as the vibrator and consists of a flat spring to which is secured a soft iron disc of the same diameter as the iron core. Upon the spring is placed a small platinum or iridium disc, and an adjustable screw is provided with a similar member and so located that the two points meet or contact.

These members are indicated clearly in the drawing presented at Fig. 16, which illustrates the vibrator construction of the Splitdorf induction coil. It will be noted that the contact spring is secured to a post member to which is also fastened the bogert hammer member. The upward movement of the hammer is limited by a stop and normally it rests against this. An adjustable ratchet screw is suspended by a bridge, not shown in the drawing, and is fitted with a platinum point which normally is in contact with the platinum member on the contact spring. The function of the ratchet screw is to provide means of securing the proper contact between the platinum points, this being determined largely by the volume of the primary current; that is, the arrangement is such that the points may be adjusted so as not to consume an excessive amount of current. The adjusting and care of

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these members will be taken up in detail and in logical sequence.

The action of the vibrator is as follows: When

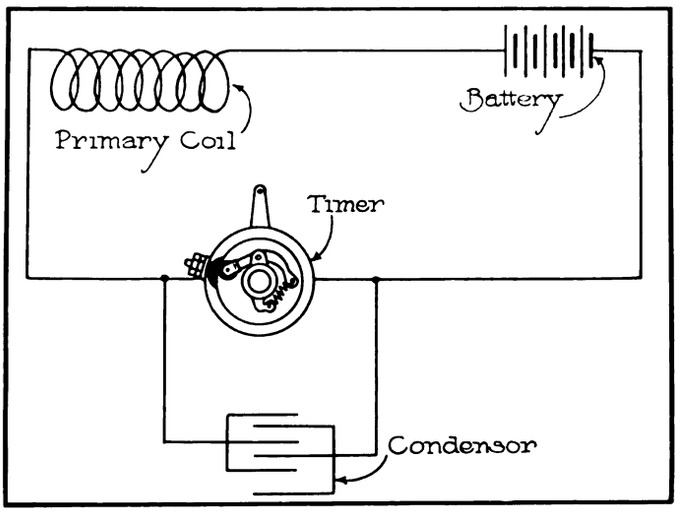


Fig. 15—Illustrating How the Condenser Is Utilized in the Induction Coil.

the contact points are together the circuit through the primary is closed. If a source of electric current were connected through the primary terminals of the coil the electricity flowing around the core through the primary winding would make a magnet of it. The core or magnet attracts the hammer member which moves downward, depressing the contact spring and separating its platinum point from that on the adjusting screw. Upon the current being interrupted the core ceases to be a magnet, and the hammer being no longer attracted, is released and moves upward, allowing the contact spring point to make contact with the other member, again completing the primary circuit. This series of making and breaking continues so long as current flows and is interrupted in the primary circuit.

Object of the Condenser.

Reference has been made to the condenser the object of which, in connection with a continuous spark coil, is to reduce pitting and sparking of the contact points, thereby prolonging their life, as well as to insure the continuous operation of the contacts. The theory is that the electro-magnetic force of self-induction which is largely instrumental in causing the spark at the break of the contact points, will expend most of its energy in charging the condenser, thus causing the break spark in the primary to be less and the current to become zero instantly. The real object of placing a condenser across the contacts of a spark coil is to absorb any extra current induced in the primary coil, due to the breaking of the circuit. This extra current would otherwise tend to prolong the magnetization of the core beyond the desired limit and thereby lower the frequency of vibration so as to make the coil not adaptable for service with a high speed motor.

Construction of Condenser.

The insulating material utilized in the construction of condensers is divided into three general classes —glass, mica and paper. The glass is used in experimental work, while for ordinary commercial uses the mica condenser is utilized only on very expensive magnetos, where cost is a secondary consideration. The paper type is most commonly used in ignition work and the manufacturer has perfected the process to the point where it is highly satisfactory. There are two principal types of paper condensers now being made, one being termed the separate sheet and the other the coated.

The separate sheet method consists of employing alternate sheets of paper and tinfoil, then rolling the mass into a flat bar. Alternate sheets of the foil are connected to one terminal, and the remaining sheets to the other, the positive and negative poles of the circuit being connected to the respective poles of the condenser. The connection and utilization of the condenser are depicted at Fig. 15.

The connections to the tinfoil, which is usually about .0005 inch thick, are by inserting near the middle of the foiled strips, pieces of annealed sheet copper about .001 inch thick and .5 inch wide, so that the real terminal lead wires may be soldered to them after the condenser is assembled. The copper is not secured in any way to the surface of the tinfoil, but makes contact in the pressing operation. Considerable care is exerted in selecting the materials for the condenser which is subjected to severe tests before being incorporated in the coil box or housing.

It will be noted that the condenser has two terminals which are connected, one on either side of the point at which the break occurs in the primary circuit. When the latter is closed or completed the condenser is short circuited, but when the circuit is broken and the induced current begins to flow, instead of jumping across the gap and thereby overcoming the effect upon the secondary circuit due to the quick break of the primary, it passes into the condenser and does not cause a spark. The current flowing in this way into the condenser passes out again and into the circuit when the latter is completed the next time.

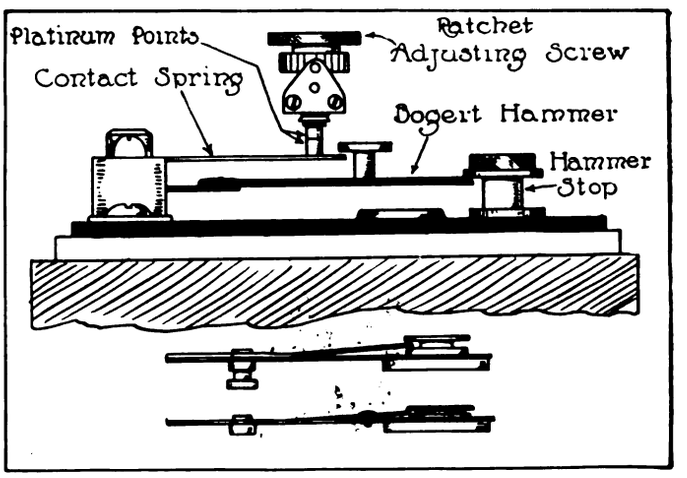


Fig. 16—Depicting the Vibrator Parts of an Induction Coil, Also Types of Vibrators.

Referring once more to Fig. 14, it will be seen that one primary and one secondary wire are coupled together inside the coil box when three terminals are

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Fig. 17—J. & B. Single-Cylinder Coil with Cover Removed to Illustrate Vibrator.

employed for coupling the coil to the external circuits, of which there are two, distinct from each other. The battery lead or terminal goes either to the contact screw or the vibrator, as the case may, the other primary being coupled with the part of the vibrator not connected to the battery, save through the medium of the platinum contact points.

The secondary circuit is distinct from the primary and includes the spark plug, while the primary current is derived from the battery and passes through a timer or commutator, the function of which is to insure that the spark will be produced at the proper instant in the cylinder. The complete circuits are shown at Fig. 14 and a little study will enable the reader to become familiar with the components and their relation to one another.

Types of Coils.

Conventional types of jump spark coils are depicted at Figs. 17, 18 and 19, these being the J. & B. one-cylinder, the K-W box or marine, and the Connecticut four-cylinder unit. Coils may be constructed for any number of cylinders although in common practise the number of units is limited to six. By referring to Fig. 19 it will be seen that each cylinder of the four-cylinder motor has a separate coil and that the four units are incorporated in one box or housing, but the primary current from the battery is controlled by one switch. Each unit is adjustable; that is, the vibrator may be set to obtain the greatest efficiency with a minimum consumption of current. A quality of this design, as well as of the coil illustrated at Fig. 17, is that the construction is such that the unit may be removed from the coil housing without detaching any leads. This is made possible by spring like contact members and the design enables the replacement of a defective unit with a new one without dismantling the coil proper. It also permits of the testing of the ignition, the various methods for accomplishing which will be taken up in logical sequence.

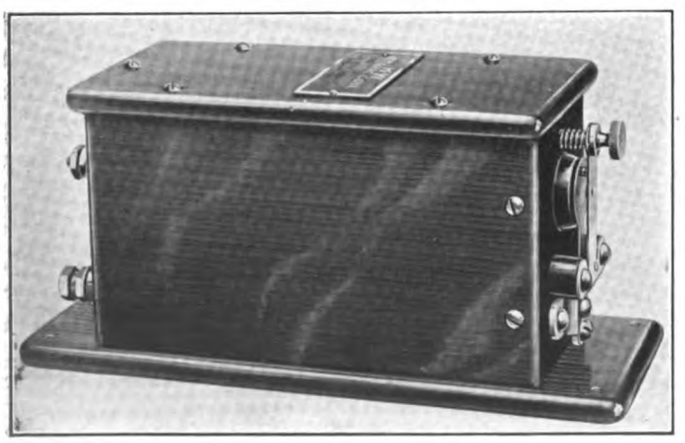


Fig. 18—The K-W Single-Cylinder Coil of the Box Type Utilized Largely with Marine Motors.

Non-Vibrating Coils.

Although the low-tension or make and break system of ignition has been succeeded largely by the high-tension, the latter including the induction coil and magneto, there are some types of automobiles which are equipped with the older form and are in service today. The low-tension current may be derived from a mechanical generator, dry cells or a storage battery. The voltage is increased through self-induction in order that the spark may be intensified, and this is accomplished through a coil the construction of which is similar to the primary of the coils previously described. A core of soft iron is surrounded by a number of turns of coarse wire the ends of which are provided with terminals for the proper leads.

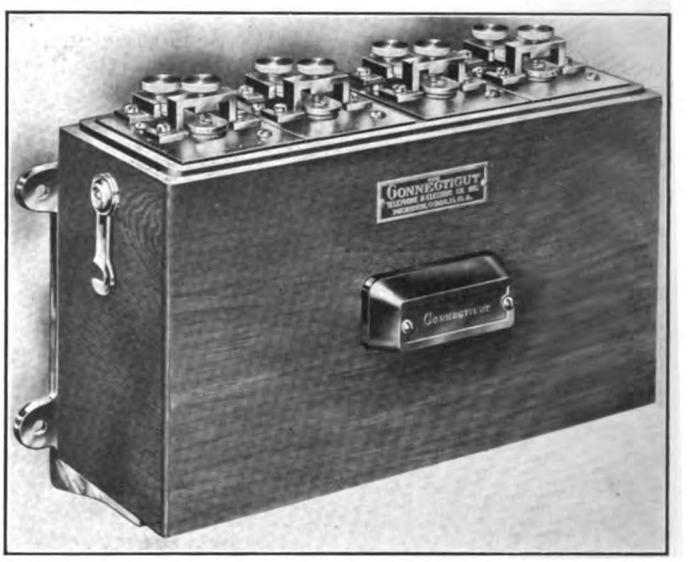


Fig. 19—The Connecticut Four-Cylinder Coil, the Units of Which May Be Removed Without Disturbing Connections.

One lead from the battery is secured to one of these terminals and the wire from the remaining post of the coil is attached to the igniter or switch member, or to the metal of the motor or ground. The other lead from the battery is secured to a part of the igniter, a section of which is insulated from the portion in contact with the metal of the cylinder.

Various forms of make and break mechanism are employed. The most common is of the hammer and anvil type, in which a movable arm actuated by the cam is brought in contact with the anvil or immovable part, and when the two pieces separate a spark is produced by the breaking of the circuit in a manner similar to that of the induction coil. The wiring is simple, the coil being incorporated in the circuit and but two wires are employed, these being from one terminal of the coil and battery to the igniter and ground, respectively. A switch is provided to interrupt the source of current when it is desired to stop the motor.

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Timing the Spark.

Theoretically, the mixture in the combustion chamber of a motor should be ignited by the spark when the piston has completed the compression stroke and is about to descend on the power or impulse stroke. This does not occur in practise, however, as there is a certain delay or lag in the generation of the spark and in reaching the spark plug. The variable speed of the motor is another factor and to equalize or balance these conditions, as well as to break the primary circuit, a timer or commutator is employed.

Briefly speaking it may be termed a switch in that it interrupts the flow of the primary or battery current at the desired time of ignition and when the piston has compressed the charge of mixture. At Fig. 20 are presented conventional types of timers employed on four-cycle motors, that at D showing the constructional details, a little study of which will enable the reader to follow its operation easily.

It will be noted that the arm or lever member carrying a roller, is secured to a shaft. The latter is actuated by the camshaft of the motor and with the four-cycle type makes one revolution to two of the crankshaft. With a two-stroke cycle engine the shaft is driven at motor speed.

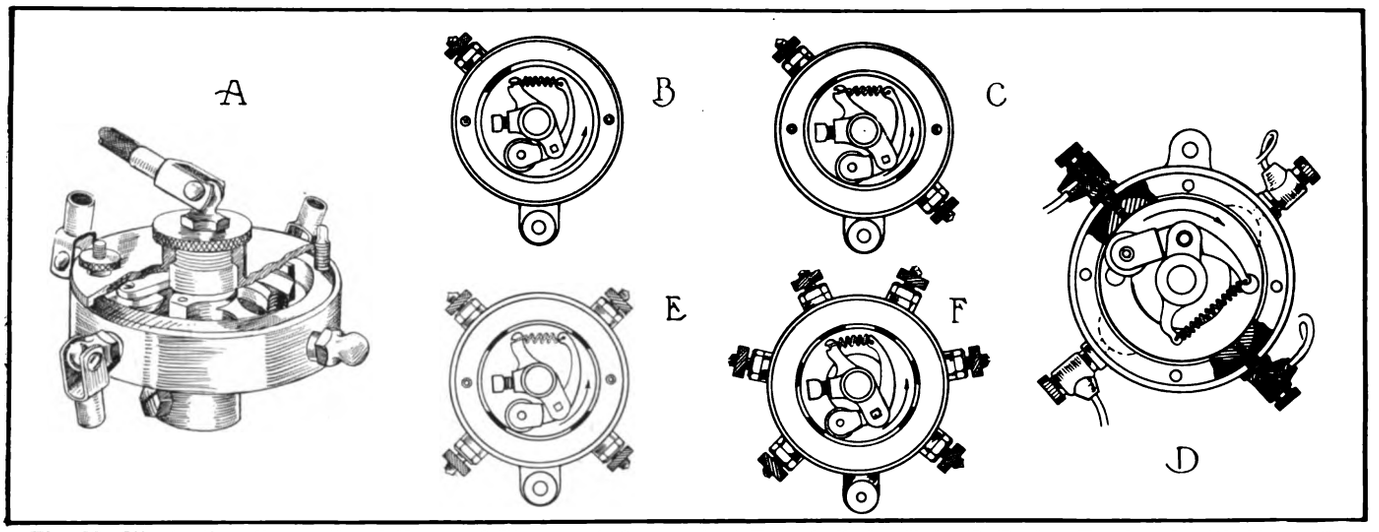


Fig. 20—Illustrating Conventional Types of Timers: A Connecticut Four-Cylinder Unit; B, Design Employed with Single-Cylinder Motor; C, Two-Cylinder with Contacts 180 Degrees Apart; D, Showing Construction of Timer and Insulated Contact Blocks; E, Four-Cylinder; F, Six-Cylinder.

Construction of Timers.

The housing containing the roller and arm members is so mounted upon the shaft that the former may rotate, although the casing is held stationary by means of a rod or lever which may be moved in either direction to retard or advance the spark—an operation which will be explained later. Within the housing, which is usually constructed of aluminum, is a fibre ring in which are inserted metal contact blocks, the surfaces of these being flush with that of the fibre. The blocks are secured through a threaded bolt which passes through but is insulated from the aluminum by fibre, as denoted by the black portions at D.

The contact block screw bolt is provided with a terminal and locking nuts to which is secured a primary wire which in turn is connected to the primary terminal of the induction coil. As the shaft actuating the roller is metal and one lead from the battery is connected to the frame or other metal of the chassis, the current is conducted from its source to the block. When the roller makes contact with the metal block in the fibre the circuit is closed and the electricity flows through the roller, motor, frame and primary wire back to the initial source. Upon further rotation of the shaft the connection is broken. The primary circuit in the coil is consequently established and broken, as previously described, the current being built up in the secondary winding and a spark being produced at the gap of the spark plug. If the roller is allowed to remain in contact with the block member, a series of sparks will be produced during which operation the vibrator will set up a buzzing noise.

Location of Contacts.

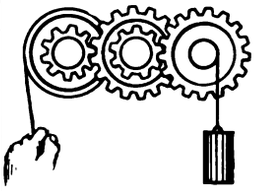
Timers may be constructed so that any number of contacts may be made, these corresponding to the number of cylinders employed. The circumference of a circle theoretically may be divided into an infinite number of parts, but mathematicians have found it convenient to divide it into 360 parts, which are called degrees. A single contact for use with a single-cylinder motor may be placed anywhere around the circumference, but if two contacts are employed, they must be placed 180 degrees apart if the motor is of the double-cylinder, horizontal opposed type, or if the two crankpins are in the same plane, as is the case with some forms of two-cylinder vertical engines. This arrangement is also in vogue with two-cycle engines with opposed cranks. On a three-cylinder motor the contacts are placed 120 degrees apart, and for a four-cylinder, 90 degrees. A six-cylinder motor requires a distance of 60 degrees and an eight-cylinder 45. There are numerous forms of timers in which various arrangements are made for making and breaking the contact, but the principle in each is similar.

(To Be Continued.)

Ed. Note—The next installment will deal with the wiring of single and multiple-unit ignition systems.

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RECENT MOTOR VEHICLE PATENTS



Springer Truck.

John Springer, Trenton Junction, N. J., has been granted a patent for a commercial vehicle which is motor propelled by the front wheels. The latter are provided with a detachable, pivotal connection with the body, and a variable friction speed gearing is incorporated in the design. Energy is transmitted from the motor by a vertical rotary shaft which is so constructed that it may be detached.

Cantrall Speed Indicator.

Forest Lee Cantrall, Ivy, Cal., has patented a speed indicator operated by electricity. A number of contacts are arranged upon the dial of the speedometer and as the indicating hand moves to and fro, the various lamp circuits are connected, lighting the respective cells of a transparent panel.

Collison Wheel Puller.

George A. Collison, Burlington, Vt., has been granted a patent for a wheel puller, comprising a base, a plurality of hooks distributed symmetrically around said base and hinged thereto. Each hook is provided with a sharp extremity and both members are connected by a link. A threaded sleeve is utilized for separating the base members and for adjusting the position of the links.

Livingston Tire Device.

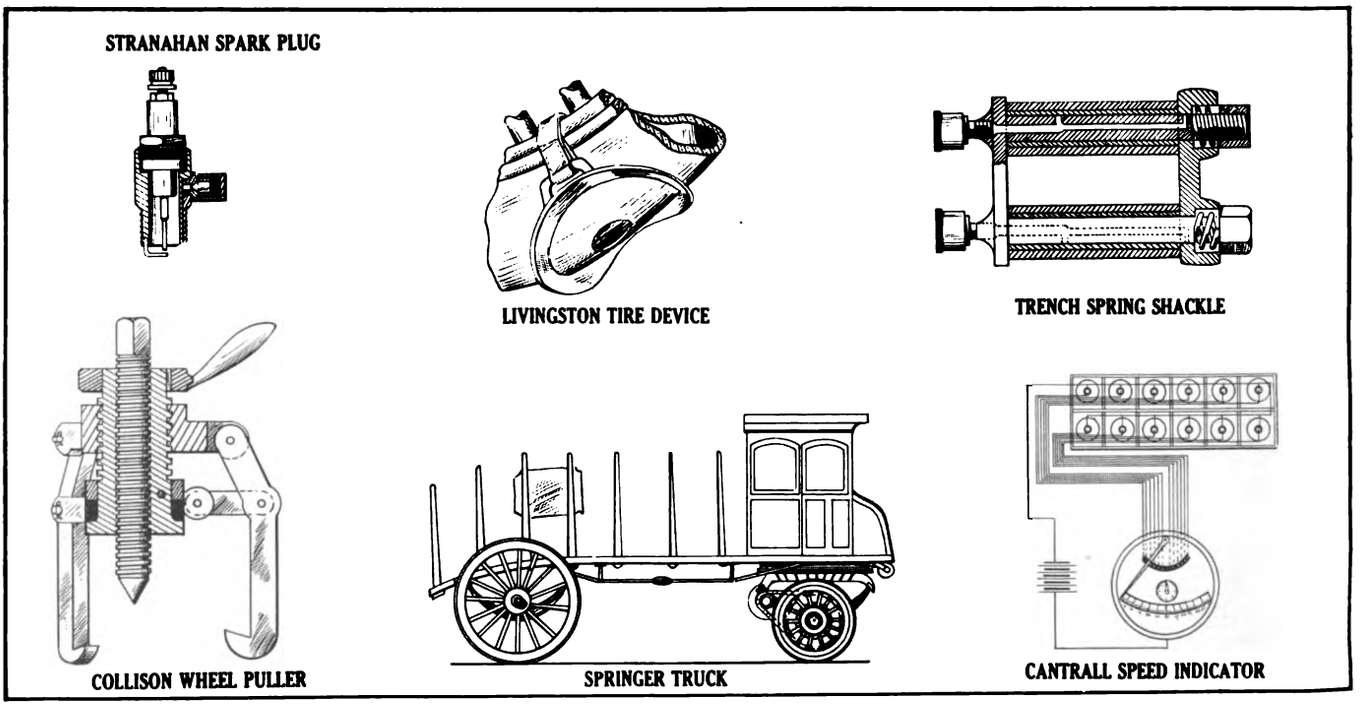
A tire traction device has been patented by Richard Livingston, Los Angeles, Cal. It comprises a tread plate curved to fit the shoe, and is provided with a central opening through which the tire may bulge slightly. The plate has a peripheral flange extending entirely around its edge and turned inwardly. The device is made detachable by a strap like arrangement, the member being secured around the felloe of the wheel and to links of the traction member.

Trench Spring Shackle.

A patent for a spring shackle has been granted to Harry G. Trench, Springfield, Mass. It comprises a bar and a pair of dowel like members arranged in separation and parallelism at right angles to the length of the bar, another bar having apertures therethrough and slidable on said members. Compression members are provided on the ends of the projections outside the slidable bar and springs are incorporated between the compression members and the slidable bar.

Stranahan Spark Plug.

Robert A. Stranahan, Toledo, O., has been granted a patent for a spark plug which is so constructed that the cylinder of the motor may be primed without removing it from the head. The shell of the plug is provided with a longitudinal passage which registers with another opening into which is threaded a nipple member having a valve threaded into the opening. A movable cap surrounds the nipple member.



Illustrating Some Recent Patents Applicable to the Commercial Vehicle, Repair Shop, Etc.

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WILL DISSEMINATE INFORMATION.

Motor Truck Club to Take a Prominent Part in the Promotion of the Industry.

The Motor Truck Club of New York City has decided to establish a permanent office at 1845 Broadway in charge of a salaried staff, and to actively engage in the collection and dissemination of motor truck information for the benefit alike of makers, dealers, owners and prospective buyers; in fact to become the metropolitan centre of motor truck interest. The management of the body will remain in the hands of the executive committee and regular standing committees have been appointed to assist in the work. Among the more important recommendations adopted are the following:

That a registry of motor truck drivers be established which shall investigate the records of drivers as to their efficiency, experience, etc., and this information to be available only to members of the club; that a bureau of information be formed; that a special committee be appointed by the president to consider the question of affiliating with the New York Chamber of Commerce, the Automobile Board of Trade, the National Association of Automobile Manufacturers and the Automobile Club of America.

It also has been voted to appoint a committee on papers to work out a comprehensive plan covering the entire year, specializing each meeting upon some particular phase of the motor truck business, as for instance, to devote one night each to engineers, owners, sales managers, factory managers, service department, tire manufacturers, body builders, power dumping device, truck manufacturers, electric truck, gasoline truck, one-ton truck, economy and owners' testimonial. Prominent men in each of these lines will be secured to deliver addresses.

President Fenner has appointed the following committees:

Executive—D. C. Fenner, Jr. (International Motors Company), C. E. Stone (Peerless), E. Lascaris (De Dion), E. O. Hoopengarner (Swinehart tires), A. N. Bingham (International), Arthur J. Slade (Atlantic), E. W. Curtis, Jr. (G. V.), L. A. Van Patten (Alco), Ellis L. Howland (Journal of Commerce), Harvey Robinson (New York Edison Company), Emerson Brooks (Remington), F. B. Porter (Chase).

Programme—C. E. Stone, A. N. Bingham, A. J. Slade, L. A. Van Patten.

Contest—E. Lascaris, George H. Duck (Alco), Henry S. Otto (International), W. H. Stewart, Jr. (Stewart Auto School), Frederick L. Colver (Locomobile), N. Mallouf (Peerless).

Finance—E. O. Hoopengarner, R. T. Allcott (Knox), F. W. Dix (Pope-Hartford).

Membership—A. N. Bingham, F. B. Porter, Robert C. Reid (Pierce-Arrow).

Publicity—A. J. Slade, John R. Eustis (New York Evening Mail), M. J. Adams (Alco).

Traffic—E. W. Curtis, Jr., T. A. Aspell (Goodrich tires), C. W. Fletcher (Walter).

Nominations—L. A. Van Patten, A. B. Cumner (Federal), A. W. Robinson (Locomobile), P. W. Gaylor (KisselKar), T. A. Aspell.

Publication—Ellis L. Howland, C. E. Stone, A. B. Cumner.

Welfare and Interest—L. A. Van Patten, E. W. Curtis, Jr., Emerson Brooks, A. J. Slade, Ellis L. Howland.

Motor Truck Show Luncheon—A. J. Slade, E. W. Curtis, Jr., John F. Plummer (Locomobile), Karl L. Frederick (Packard), Robert C. Reid, Percy W. Barton (Peerless), F. W. Croxton.

Club Emblem—Harvey Robinson, C. W. Fletcher, J. M. Charles (International).

Affiliations—Emerson Brooks, E. Lascaris, A. Masury, A. W. Robinson, A. B. Cumner.

Civic Relations—F. B. Porter, E. W. Murphy (Patterson transmission), P. K. Hexter (Gramm), C. M. Curran (International), C. A. Stewart (Automobile Dealers' Association), Oscar W. Shadbolt.

ORDERS SECOND KNOX TRUCK.

Experience with First Vehicle Such as to Warrant Purchasing Another of the Same Make.

An excellent tribute to the quality and worth of the Knox trucks, made by the Knox Automobile Company, Springfield, Mass., is reflected in the recent sale and delivery of a three-ton Knox to the Sunset Lumber Company of Oakland, Cal. This firm has had a six-ton Knox truck in use for over a year, during which time it has been subjected to the lot of the ordinary commercial vehicle. In the day's work the six-ton truck has frequently been called upon to haul loads, weighing up to a full eight tons and over roads that have proved many other trucks deficient in either power, endurance or strength. It has been only after a critical consideration of the merit and past performance of its first Knox that the Sunset Lumber Company placed its order for this second truck, which it proposes to use in delivering mill work and interior finish in and about the city of Oakland.

REO WAGONS PROVE ECONOMICAL.

Los Angeles Merchants Offer Evidence That Indicates Service Is Highly Satisfactory.

The 1500-pound Reo delivery wagons, made by the Reo Motor Truck Company, Lansing, Mich., are put to many different uses in various parts of the country. Several of these vehicles are in service in Los Angeles, Cal. The Grande Fruit Company utilizes one to deliver fresh fruit and other produce to widely separated stores in all parts of the city, and its average daily cost for operation does not exceed 50 cents.

Another is owned by the Gibson market of West Pico street. Averaging between 60 and 70 miles each day, it accomplishes this distance on three gallons of gasoline. A Reo machine in the service of the J. W. Hallman Hardware Company, carrying loads that vary from 1500 to 2000 pounds, averages between 12 and 13 miles to a gallon of gasoline and ordinarily covers 50 miles a day.

The Hartford Electric Light Company, agent for that city and vicinity for the General Vehicle Company, has recently sold 10 machines to the W. W. Walker Company, Wise, Smith & Co., and Newton, Robertson & Co., these all being 1000-pound delivery wagons with Edison battery equipment.

The Wells, Fargo Express Company has purchased nine General Vehicle chassis, six of two tons and three of 3.5 tons capacity, which will be equipped with covered express bodies and placed in service in Brooklyn, N. Y. All of these machines are to be equipped with Edison batteries.

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BRIEF NEWS OF MANUFACTURER AND THE TRADE

The Dayton Auto Truck Company has been incorporated at Wilmington, Del., with a capital of $100,000.

E. E. Gerlinger, Portland, Ore., has taken the agency for Standard trucks for Washington, Idaho and Oregon.

The Motz Tire & Rubber Company, Akron, O., is enlarging its office space to accommodate the company's expanding business.

The American Locomotive Company, Providence, R. I., has appointed G. L. Sullivan manager of the branch at Chicago for Alco trucks.

The National Motor Truck Company, Bay City, Mich., is seeking agents to represent the National truck in various parts of the country.

E. E. Denniston has been appointed manager for the Stewart Motor Corporation, Buffalo, N. Y., maker of Stewart trucks, for Illinois, Iowa and Missouri.

The Funger Motor Trucking Company has been incorporated at East Orange, N. J., by Minnie C. Funger, David L. Horton and Alfred J. Grosse. The capital of the concern is $100,000.



Kansas City Branch of Kelly-Springfield Motor Truck Company, Equipped for Unequalled Service to Truck Owners.

The Cleveland-Galion Motor Truck Company, Galion, O., has amended its articles of incorporation to increase its capital stock from $300,000 to $1,000,000.

The Monarch Motor Truck Company, Brooklyn, N. Y., has been incorporated with a capital of $5000 by Daniel R. Rice, Helen Person and Walter H. Babcock.

The Falk Company, Milwaukee, Wis., maker of gasoline and kerosene engines, has appointed C. F. Chase as sales manager of the gas engine department.

The Dodge Motor Vehicle Company, Boston, has taken over the New England distributing rights for the Buffalo electric, formerly known as the Babcock electric.

The Gramm Motor Truck Company, Lima, O., maker of Gramm trucks, has filed its trade mark, "Gramm," to protect it from possible infringement, in the state of Oklahoma.

The Buick Motor Company, Flint, Mich., has sold its truck factory at Jackson, Mich., and in future will manufacture the Buick trucks on a much larger scale at the Flint factory.

The Garford Company, Elyria, O., maker of Garford trucks, is erecting a concrete storage warehouse, for material and parts, with one section devoted to finished car storage and loading dock.

The White Company, Cleveland, O., maker of White pleasure cars and trucks, is planning a new one-story brick factory building at St. Clair avenue and East 79th street.

L. A. Austin, until recently sales and advertising manager of the Rutenber Motor Company, Marion, Ind., has resigned to become general sales manager of the Mais Motor Truck Company, Indianapolis, Ind.

The Gramm Motor Truck Company, Lima, O., maker of Gramm trucks, has announced that hereafter the Bond Motor Company, Kansas City, Mo., and O. G. Roberts of Columbus, O., will handle the product of the Lima factory in those cities.

A. S. Holly, formerly manager of the truck department of the Packard Motor Car Company, Detroit, has resigned to become manager of the New York City factory branch of the Kelly-Springfield Motor Truck Company, Springfield, O.

The Harwood-Barley Company, Marion, Ind., has just built the first three-ton Indiana truck put in service at Pittsburg, Penn. It made the run from Marion to Pittsburg in 18 hours. The vehicle is equipped with Liggett springs and axles.

J. G. Budd has taken the position of general sales manager of the Sanford Motor Truck Company, Syracuse, N. Y., maker of Sanford trucks. He was formerly manager of the Victor Motor Truck Company, Buffalo, N. Y., builder of Victor trucks.

L. A. Bartlett, formerly sales manager of the Poss Motor Company, Detroit, maker of Poss trucks, has joined the sales force of the Universal Motor Truck Company, maker of Universal trucks, and has been assigned to the Chicago territory.

F. L. Loomis of the Robinson-Loomis Motor Truck Company, Minneapolis, Minn., has severed his connection with the truck manufacturing business and is seeking an entry in the distributing end, representing both pleasure and commercial vehicles.

The Kelly Motor Truck Company, 1523 McGee street, Kansas City, Mo., is the local branch of the Kelly-Springfield Motor Truck Company, Springfield, O. An accompanying illustration presents an idea of the facilities afforded owners of vehicles made by this concern in Kansas City and vicinity.

P. W. Klinger, who has for some time served the Speedwell Motor Car Company, Dayton, O., maker of Speedwell trucks, in the capacity of factory manager, has recently assumed the position of chief engineer.

The Frank Rilion Company, Boston, well known in the electrical field, has made arrangements to build motor trucks of one to six tons capacity. Victor J. Houdon is the designer and the vehicles will be manufactured at the factory in South Boston.

Theodore D. Gere and Frank B. Tracy of Oswego N. Y., are negotiating for the lease of the Robert Nichols building in Oswego for a manufacturing plant, they having formed a partnership to make a commercial motor vehicle.

The Gramm-Bernstein Company, Lima, O., has turned out its first truck, which is now ready for the market. The vehicle is 3.5 tons capacity and this, with another of two tons capacity, will be the only trucks produced by the company for the present.

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The Piggins Motor Truck Company, Racine, Wis., maker of the Piggins truck, has established a branch at San Francisco, Cal., to serve as a distributing depot for the entire West, Hawaii and the Orient. J. I. McLaughlin has been appointed manager.

Albert Engelhardt has resigned as vice president and secretary of the Universal Truck Company, Detroit, maker of Universal trucks, to assume the New York agency for the Stegeman trucks, made by the Stegeman Motor Car Company, Milwaukee, Wis.

C. L. Morgan, formerly manager of the electric division of the General Motors Truck Company, Pontiac, Mich., maker of G. M. C. trucks, has become identified with the St. Louis Billing Machine Company, St. Louis, Mo., with headquarters at New York City.

Thomas O'Brien of Syracuse, N. Y., has contracted with J. W. Lee of the Overland Syracuse Company to distribute Garford pleasure cars and trucks, made by the Garford Company, Elyria, O. T. F. Fitzpatrick of the Overland Syracuse Company will have charge of the truck department.

The Federal Chain & Manufacturing Company, Springfield, Mass., has purchased of the Atlas Chain Company, Brooklyn, N. Y., all rights to manufacture and sell Gaylor traction grips for commercial vehicles. The device was placed on the market in January and has been favorably received in the trade.

The Packard Motor Car Company, Detroit, is occupying its new factory for the production of Packard trucks, which has ground space equivalent to the ordinary city block. The lower floor embraces a continuous and unobstructed area exceeding 100,000 square feet. These shops are producing five trucks a day, and the construction makes provision for additional floors in the future should occasion require.

O. R. Fuller, Los Angeles, Cal., has secured plans for the erection of a garage at 719 North Alameda street, to cost $20,000. He will handle G. M. C. trucks, made by the General Motors Truck Company, Detroit, and the Randolph trucks, manufactured by the Randolph Truck Company, Flint, Mich.

Morton H. Luce has resigned the management of the Chicago branch of the Velie Motor Vehicle Company, Moline, Ill., maker of Velie trucks, to join the sales force of the Marion Motor Car Company, Indianapolis, Ind., maker of Marion cars. He will be its eastern representative with headquarters at New York.

Harold Smith, formerly advertising manager of General Motors Company, Detroit, has resigned to become affiliated with the Carl M. Green Advertising Agency, and will handle the company's advertising from that office, which has secured the contract since the General Motors Company decided to dispense with its own publicity department.

J. W. Leavitt Company, San Francisco, Cal., distributor of Overland and KisselKar trucks and light delivery wagons, has found it necessary to enlarge its quarters in Golden Gate avenue, owing to the development of the commercial vehicle industry on the Pacific Coast. The additional space will be given over to the truck department, which is under the management of Walter J. Andrews.

The General Motor Car Company, Philadelphia, agent for Lozier, Paige-Detroit and Rauch & Lang electrics, has leased premises on Ludlow street, containing 52,000 square feet of floor space for salesrooms, repair shop, paint and body shops, etc. After an expenditure of $40,000 to adapt the building to its purpose the firm will occupy it about Jan. 15, 1913.

The American Locomotive Company, New York City, has appointed the following new dealers for Alco trucks: Auto Repair Company, Chattanooga, Tenn.; Asheville Auto Company, Asheville, N. C.; Tri-State Chalmers Company, Memphis, Tenn.; E. A. Merrill, Grand Rapids, Mich.; Kankakee Motor Car Company, Kankakee, Ill., Star Garage Company, Erie, Penn.

The Federal Motor Truck Company, Detroit, has appointed the following agents for Federal trucks: W. Conway Thompson, Greenville, S. C.; Pacific Car Company, Seattle, Wash.; Wade & Adellman, Boise, Idaho; Allen & Dunn, Grant's Pass, Ore.; Hanna Bros., Independence, Ore.; B. O. Boedigheimer, Salem, Ore.; R. B. Kelly, Poughkeepsie, N. Y.; Union Auto Company, Union, N. J.

The Baker Motor Vehicle Company, Cleveland, O., maker of Baker electrics, has reported the largest monthly sales in the history of the company for October, 1912. The sales for this month over the corresponding month in 1911, show a net gain of 123 per cent. This is 36.5 per cent. higher than the total sales of April, 1911, which previously marked the greatest monthly volume of sales in the history of the Baker company.

The Stewart Motor Corporation, Buffalo, N. Y., has appointed Henry E. Riker & Co., Cleveland, O., state distributor for Ohio for the Stewart light delivery trucks. The company will erect a large service station on Euclid avenue and the state will be covered by a number of travelling men. Mr. Riker, head of the new concern, was formerly general auditor for the Firestone Tire & Rubber Company, which position he left to engage in the truck business.

The Standard Motor Truck Company, 2352 Euclid avenue, Cleveland, O., was recently incorporated and has practically completed its first allotment of one-ton trucks. The second lot has been started. The officers of the company are: President, C. W. Moody; vice president, A. F. Shroeder; secretary and treasurer, H. E. Riker. All these men were formerly Cleveland agents for the Chase trucks, made by the Chase Motor Truck Company, Syracuse, N. Y.

The Southwestern Motor Sales Company, Dallas, Tex., has been incorporated with a capital stock of $500,000 and quarters have been opened at 1608 Commerce street. The company will represent in Texas the Lozier, Speedwell, Staver and Little automobiles and the Speedwell and Staver trucks. C. R. Jones is in charge of the truck department. The officers of the concern are: President, L. A. Boli; vice presidents, C. Charles Jones and Martin A. Steward; secretary, W. L. Marsh; treasurer, N. E. Jones.



Excellent New Truck Factory of Packard Motor Car Company, Detroit, Where Five Vehicles Are Turned Out Daily.

The Kissel Motor Car Company, Hartford, Wis., maker of KisselKar trucks and pleasure cars, has established a large service station at 1030 Commonwealth avenue, Boston, with Manager Pruden of the New England branch in charge. The building is two stories high, of reinforced concrete. The second floor is used for the truck department and a large turntable is provided for the handling of the large trucks. The rear of the second floor has the repair shop, which is equipped with every known device, including electrical machines of all modern kinds to facilitate the repair of pleasure and commercial vehicles.

The Stewart Motor Corporation, Buffalo, N. Y., maker of the Stewart light delivery wagon, has appointed the following new dealers to handle its product: Allen Motor Company, Allentown, Penn.; Borg & Wharry Motor Company, St. Paul, Minn.; Coast Commercial Car Company, Portland, Ore.; Crim-Bronner Auto Company, Utica, N. Y.; Albert Biner, Los Angeles, Cal.; Federal Truck Company of St. Louis, St. Louis, Mo.; Gomery-Schwartz Motor Car Company, Philadelphia, Penn.; Gomery-Schwartz Motor Car Company, Wilmington, Del.; Mandery Motor Car Company, Rochester, N. Y.; Martin & Crocker, Nashville, Tenn.; R. Stuart Beaver, Baltimore, Md.; Northrup Motor Service Company, Edmonton, Alberta, Can.; North Shore Motors & Service Company, Salem, Mass.; Koons & Hallier, Wilkesbarre, Penn.; Henry E. Riker & Co., Cleveland, O.; Savannah Motor Car Company, Savannah, Ga.; Young & Dewire, Houston, Tex.; Reimold Bros., Buffalo, N. Y.

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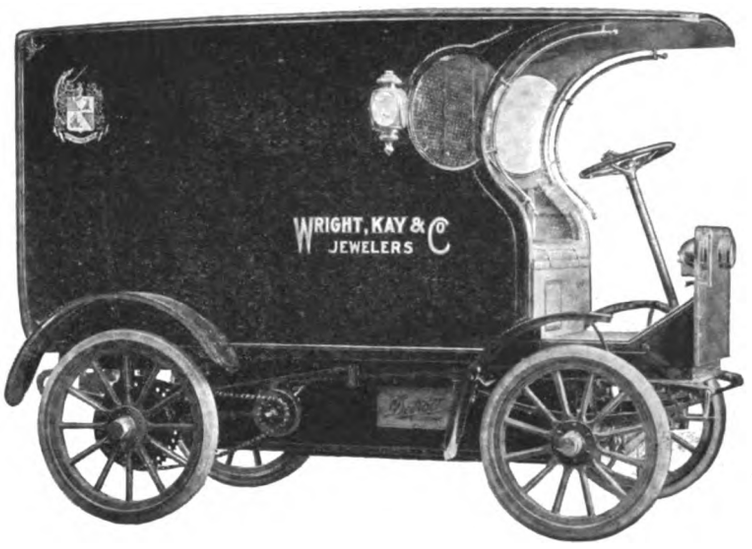
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THE Detroit ELECTRIC
Commercial Vehicles

Detroit Electric Commercial Vehicles Adapted to Frequent Stops

MR. MERCHANT, you will lose or gain on your delivery service, according to the fitness of the equipment you use. Your delivery work probably calls for frequent stops, the delivery of a parcel here, another one across the street, then some a few blocks further, etc. All of which demands, for economy of time and money, quick stopping of the vehicle, quick starting and no loss of time between deliveries to customers. Also there must be no waste of power while the car is standing still, if there is to be the greatest profit from this department of your business.

Detroit Electrics are admirably adapted to meet all these requirements. They are the most practical, on the rigid standard of profit in dollars and cents.

Detroit Electric Commercial Vehicles "get away" instantly. They pick up speed quickly and smoothly, causing no loss of time in starting.

All speeds are controlled with one lever, the application of power being continuous. No loss of headway in changing speeds.

Then, too, they stop quickly and easily and when the car stops, the power stops—and the expense for power. There is absolutely no loss from useless running of the motor or from wear of parts while your drivers are making deliveries. This feature of the electric vehicle makes it especially suitable for the merchant's use and insures the greatest economy in the use of the delivery equipment.

Besides these valuable features of the Detroit Electric, there are the qualities of absence of noise and odor, which makes this the ideal commercial vehicle for city and suburban use. They are handsome and trim in appearance and make a distinct advertisement of the progressiveness of the merchants who use them.

Let us take up your delivery problem with you and help you to make the most practical selection of equipment. Our 48-page illustrated catalog will be sent on request.

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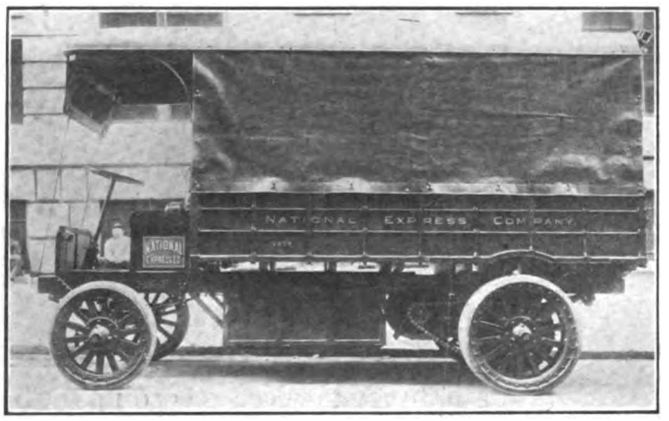
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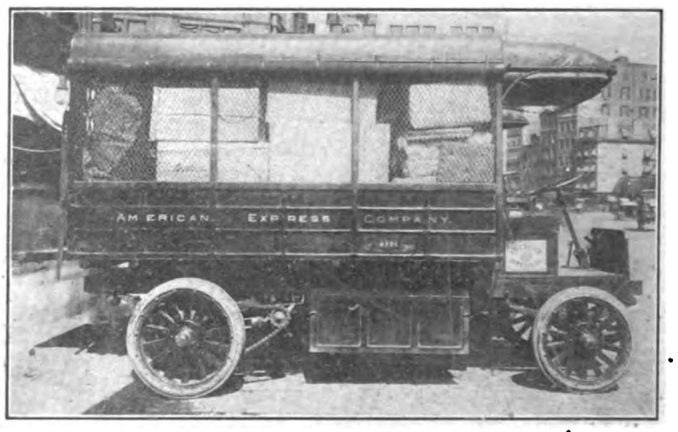
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